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STATE OF CONNECTICUT

NINETEENTH ANNUAL REPORT

OF

The Connecticut Agricultural Experiment Station

For 1895

Printed by Order of the General Assembly

The publications of this Station are sent free to every citizen of Connecticut who applies for them. Address, The Conn. Agricultural Experiment Station, New Haven, Conn.

NEW HAVEN:
THE TUTTLE, MOREHOUSE & TAYLOR PRESS
1896

CORRECTIONS.

Page 5. Among firms who have paid analysis fees to May 1, 1896 insert,

Danbury Fertilizer Co., Danbury, Conn.	Bone Meal. Nameless Fertilizer. Potato Manure.

Page 16. Fourth line from top, insert organic, before the word nitrogen and in the same line, for 18½, read 16½.

Page 41. The valuation of Sanderson's Old Reliable Phosphate, analysis No. 4800, should be $23.28 instead of $26.79, and the percentage difference, 28.8 instead of 11.9.

Page 102. Thirteenth line from top, for 11.4 read 13.4.

Page 105, pot No. 117. For weight of water-free Maize crop, read 141.58 instead of 145.58.

Page 146, in the table of Composition of Fertilizers, the per cent. of potash in cotton hull ashes should read 24.11 instead of 2.41.

CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

OFFICERS AND STAFF FOR 1895.

STATE BOARD OF CONTROL.

		Term expires,
	Ex-officio.	
	His Excellency O. VINCENT COFFIN, *President.*	
	Appointed by Connecticut State Agricultural Society:	
	Hon. E. H. HYDE, Stafford, *Vice-President.*	July 1, 1897
	Appointed by Board of Trustees of Wesleyan University:	
	Prof. W. O. ATWATER, Middletown.	1897
	Appointed by Governor and Senate:	
	EDWIN HOYT, New Canaan.	1898
	JAMES H. WEBB, Hamden.	1896
	Appointed by Board of Agriculture:	
Executive Committee.	T. S. GOLD, West Cornwall.	1898
	Appointed by Governing Board of Sheffield Scientific School:	
Executive Committee.	W. H. BREWER, New Haven, *Secretary and Treasurer.*	1896
	Ex-officio.	
Executive Committee.	S. W. JOHNSON, New Haven, *Director.*	

STATION STAFF.

Chemists.

S. W. JOHNSON, *Director.*
E. H. JENKINS, Ph.D., *Vice-Dir.*
A. L. WINTON, Ph.B.
T. B. OSBORNE, Ph.D.
A. W. OGDEN, Ph.B.
G. F. CAMPBELL, Ph.B.

Mycologist.

WILLIAM C. STURGIS, Ph.D.

Horticulturist.

W. E. BRITTON, B.S.

Grass Gardener.

JAMES B. OLCOTT, South Manchester.

Stenographer and Clerk.

Miss C. S. GREEN.

In charge of Buildings and Grounds.

CHARLES J. RICE.

Laboratory Helpers.

HUGO LANGE.
JULIUS KORN.

Sampling Agents.

C. L. BACKUS, Andover.
M. H. PARKER, So. Coventry.

Notice as to Bulletins.

The Bulletins of this Station are mailed free to citizens of Connecticut who apply for them, and to others, as far as the limited editions permit.

Applications should be renewed annually before January 1st.

The matter of all the Bulletins of this Station, in so far as it is new or of permanent value, will be made part of the Annual Report of the Station Staff.

All Bulletins earlier than No. 71 and Nos. 83, 93, 101, 102 and 118 are exhausted and cannot be supplied.

Notice as to Supply of Station Reports.

The Station has no supply of its Annual Reports for the years 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1887, 1891 and 1893.

The Annual Report of this Station, printed at State expense, is by law limited to an edition of 12,000 copies, of which 5,000 copies are bound with the Annual Report of the Connecticut State Board of Agriculture, and distributed by the Secretary of the Board, T. S. Gold, West Cornwall, Conn.

After exchanging with other Experiment Stations and Agricultural Journals, the Reports remaining at the disposal of the Station will be sent to citizens of Connecticut who shall seasonably apply for them, and to others as long as the supply lasts.

ANNOUNCEMENT.

The Connecticut Agricultural Experiment Station was established in accordance with an Act of the General Assembly approved March 21, 1877, "for the purpose of promoting Agriculture by scientific investigation and experiment."

The Station is prepared to analyze and test fertilizers, cattle-food, seeds, milk, and other agricultural materials and products, to identify grasses, weeds, moulds, blights, mildews, useful or injurious insects, etc., and to give information on various subjects of Agricultural Science, for the use and advantage of the citizens of Connecticut.

The Station does not undertake sanitary analyses of water.

The Station makes analyses of Fertilizers, Seed-Tests, etc., for the citizens of Connecticut, without charge, provided—

1. That the results are of use to the public and are free to publish.
2. That the samples are taken from stock now in the market, and in accordance with the Station "Instructions for Sampling."
3. That the samples are fully described and retail prices given on the Station "Forms for Description."

The officers of the Station will take pains to obtain for analysis samples of all the commercial fertilizers sold in Connecticut; but the organized coöperation of farmers is essential for the full and timely protection of their interests. Granges, Farmers' Clubs, and like Associations can efficiently work with the Station for this purpose, by sending in duly authenticated samples early during each season of trade.

☞ By a recent Act of Legislature it is made the business of this Station to examine articles of food and drink on sale in Connecticut, with reference to their adulterations.

Here it may be stated that, *until further notice*, the Station will examine only such samples of food and drink as are collected by its agents or such as shall be taken under its advice, and by the methods it shall prescribe or approve.

All other work proper to the Experiment Station that can be used for the public benefit will be done without charge. Work for the private use of individuals is charged for at moderate rates. The Station undertakes no work, the results of which are not at its disposal to use or publish, if deemed advisable for the public good.

Results of analysis or investigation that are of immediate general interest are published in Bulletins, copies of which are sent to each Post Office in this State, and to every citizen of the State who applies for them. The results of all the work of the Station are summed up in the Annual Reports made to the Governor.

It is the wish of the Board of Control to make the Station as widely useful as its resources will admit. Every Connecticut citizen who is concerned in agriculture, whether farmer, manufacturer, or dealer, has the right to apply to the Station for any assistance that comes within its province to render, and the Station will respond to all applications as far as lies in its power.

☞ Instructions and Forms for taking samples, and Terms for testing Fertilizers, Seeds, etc., for private parties, sent on application.

☞ Parcels by Express, to receive attention should be *prepaid.*

☞ Letters sent to individual officers are liable to remain unanswered in case the officer addressed is absent. All communications on Station business that requires immediate attention, therefore, should be directed simply to the

AGRICULTURAL EXPERIMENT STATION,
NEW HAVEN, CONN.,

and all remittances should be made payable to the undersigned.

☞ Station Grounds, Laboratories and Office are on Suburban st., five minutes walk west from Whitney avenue and 1⅝ miles north of City Hall.

☞ Suburban st. may be reached by Whitney ave. Electric Cars, which leave the corner of Chapel and Church sts., five times hourly, viz: on the striking of the clock and at intervals of twelve minutes thereafter.

☞ The Station may also be reached by taking Winchester ave. Electric Cars, going north, which pass the Union R. R. Depot, and also start from corner Chapel and Church sts., at intervals of sixteen minutes. Get off at Harriet st., whence five minutes walk eastward, crossing Prospect st., and entering Suburban st. brings to the Station.

☞ The Station has Telephone connection and may be spoken from the Central Telephone Office, 118 Court st., or from Peck & Bishop's Office in Union R. R. Depot, New Haven.

☞ The Grass Garden, in charge of Mr. James B. Olcott, is near South Manchester, two minutes walk from the line of the Manchester Electric Cars, leaving City Hall square, State st., Hartford, every half hour. Conductors on this line can direct visitors to the Garden.

S. W. JOHNSON, *Director.*

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REPORT OF THE TREASURER.

Wm. H. Brewer, in account with the Connecticut Agricultural Experiment Station for the fiscal year ending September 30th, 1895.

Receipts.

	Oct. 1894 to June 1895.	July to Sept. 1895.	Total.
State Appropriation	$6,000.00	$2,500.00	$8,500.00
United States Appropriation	5,625.00	1,875.00	7,500.00
Analysis Fees due last fiscal year	617.96		617.96
Analysis Fees due this fiscal year	4,507.07	1,504.93	6,012.00
Miscellaneous Receipts	113.11		113.11
Balance from last account	18.13		18.13
Total Receipts	$16,881.27	$5,879.93	$22,761.20

Expenditures.

	State Acc't.	U. S. Acc't.	Total.
Salaries*	$5,563.00	$5,600.00	$11,163.00
" †	1,897.50	1,875.00	3,772.50
Labor*	549.80		549.80
" †	28.05		28.05
Publications*	210.56		210.56
" †	106.93		106.93
Postage*	94.22		94.22
" †	45.10		45.10
Stationery*	68.83		68.83
" †	42.90		42.90
Freight and Express*	63.44		63.44
" " †	15.82		15.82
Coal*	554.05		554.05
Gas*	239.29		239.29
" †	46.75		46.75
Water*	147.00		147.00
Chemicals*	156.58		156.58
" †	295.93		295.93
Laboratory Supplies*	58.63		58.63
" " †	41.28		41.28
Agricultural Supplies*	51.90		51.90
" " †	12.00		12.00
Horticultural Supplies*	4.50		4.50
" " †	21.65		21.65
Botanical Supplies*	5.64		5.64
" " †	14.28		14.28

* For the 9 months, October 1st, 1894, to June 30th, 1895.

† For the 3 months, July 1st to September 30th, 1895.

	State Acc't.	U. S. Acc't.	Total.
Miscellaneous Supplies*	$58.87		$58.87
" " †	8.07		8.07
Fertilizers*	128.50		128.50
Feeding Stuffs*	80.90		80.90
" " †	24.79		24.79
Library*	378.52	$10.00	388.52
" †	115.83		115.83
Tools and Machinery*	18.35		18.35
" " †	24.70		24.70
Furniture and Fixtures*	24.71		24.71
" " †	46.30		46.30
Scientific Apparatus*	318.89	15.00	333.89
" " †	138.23		138.23
Live Stock*	140.00		140.00
Traveling Expenses of the Board*	5.65		5.65
" " " " †	38.77		38.77
" " " Staff; dairy Exp.*	28.80		28.80
" " " Tobacco Exp.*	63.75		63.75
" " " " †	24.54		24.54
" " " Field Exp.*	26.55		26.55
" " " " †	25.40		25.40
" " " Miscel. Work*	183.06		183.06
" " " " †	12.35		12.35
" " " Sampling Fer.*	234.99		234.99
" " " " †	3.45		3.45
Telephone*	147.42		147.42
" †	11.60		11.60
Tobacco Investigation*	140.43		140.43
" " †	286.72		286.72
Grass Investigation*	50.00		50.00
Field Experiments†	38.50		38.50
Miscellaneous Sundries*	50.67		50.67
" " †	52.20		52.20
Food Sampling†	11.74		11.74
New Buildings*	1,013.80		1,013.80
" " †	403.66		403.66
Betterments*	135.65		135.65
Repairs*	220.82		220.82
" †	208.39		208.39
	$15,261.20	$7,500.00	$22,761.20

The accounts of the treasurer were duly audited by the State Auditors of Public Accounts, on September 13th, for the first nine months, and for the remaining three months on December 3d, and after rendering the report for the United States fiscal year, the books of the treasurer were examined by an agent of the Secretary of Agriculture.

By Act of Congress, the Experiment Stations receiving appropriations from the United States are required to make treasurer's

* For the 9 months, October 1st, 1894, to June 30th, 1895.

† For the 3 months, July 1st to September 30th, 1895.

reports annually to the Secretary of Agriculture as to how the money received from that source has been expended, which reports are to be in accordance with a schedule prepared by the said Secretary and for the fiscal year of the United States. The Secretary of Agriculture makes the reasonable request that all the Stations having other sources of income, keep their books in accordance with the before mentioned schedule and furnish him with a full treasurer's report of the Station's total receipts and expenses.

In complying with above requirement and request, it is necessary that the treasurer of this Station make two different annual reports, one to the United States Secretary of Agriculture and covering the United States fiscal year ending June 30th, and the other for the State fiscal year ending September 30th.

If the two reports of receipts and expenditures give the amounts for the respective years only as a whole, it is obvious that the figures in these reports will differ both in their totals and in their details, and consequently that their comparison and agreement could only be made by a study of the original books. The treasurer has therefore given in each report the figures for the nine months and the three months respectively, in order that their correlation and comparison may be easily made.

WM. H. BREWER, *Treasurer.*

Dec. 13th, 1895.

REPORT OF THE BOARD OF CONTROL.

To His Excellency, O. Vincent Coffin, Governor of Connecticut:

The Board of Control of the Connecticut Agricultural Experiment Station herewith submits its report for the year ending October 31st, 1895.

LEGISLATION AFFECTING THE STATION.

The General Assembly at the January session, 1895, passed an Act making an appropriation to the Connecticut Agricultural Experiment Station, which added $2,000 to the annual appropriation made by the State, and provided besides the sum of $2,500 for better equipping and making additions to the laboratories, and for other specified objects.

The General Assembly also passed an Act regulating the manufacture and sale of food products which appropriated $2,500 annually to this Station, to execute the provisions of the law.

Copies of these acts will be printed with the Report of the Station staff, which is now in preparation.

EXAMINATION OF FOOD PRODUCTS.

Although the appropriation made in the Pure Food Bill does not become available until the first of November, 1895, the work of preparing for the execution of the law and of collecting and examining samples of food was early begun.

Nineteen samples of molasses, sixteen of sugar, twenty-one of maple syrup, eighteen of strained honey, forty-one of lard and forty of spices have been collected and examined or are in process of examination. The results of this work will be discussed in the Report on Foods, which will form part of the 20th annual Report of this Station for the year 1896.

THE FERTILIZER CONTROL.

During the months of April, May and June, Messrs. C. L. Backus, of Andover, and M. H. Parker, of Coventry, agents of this Station, visited one hundred and six towns and villages, to inspect commercial fertilizers, and drew five hundred and fifty-five samples, representing one hundred and ninety-nine brands of commercial fertilizers.

Analyses of all these brands have been made in duplicate in the chemical laboratory by Messrs. Winton and Ogden, with the assistance of Mr. Lange, and manuscript copies of each analysis have been sent to the manufacturer and to the dealers.

No fraudulent fertilizers have been found in the State this year. A small number, of very inferior value, are annually offered, but usually disappear from the market after their analyses have been published.

THE WORK OF THE CHEMICAL LABORATORY.

Besides the work of analyzing food and of the fertilizer control just mentioned, Messrs. Winton and Ogden, with Mr. Lange's help, have analyzed two hundred and eight commercial fertilizers and manurial waste products, making the whole number of fertilizer analyses four hundred and seven.

To supplement horticultural work done by Mr. Britton, they have analyzed eight samples of lettuce, five of tomato vines, eight of tomato fruit, one of soil, one of chemicals, and one hundred and thirty-seven of crops grown in vegetation pots.

In connection with Station field experiments they have analyzed six samples of cow-pea plants, eighteen of potatoes, eight of corn and corn stover, and one hundred and sixteen of leaf tobacco.

Thirteen samples of feeds, one of vinegar, five of poultry feeds and fourteen of milk, have been analyzed in response to requests from citizens of the State. No record has been kept of the considerable number of determinations of fat in cream and milk, made for creameries, milk dealers and consumers. Fifteen determinations of nitric acid in soil decoctions were also executed.

Forty-eight samples of butter and molasses have been examined for the State Dairy Commissioner.

In connection with the tobacco experiment at Poquonock, daily determinations of moisture were made in the soil of the tobacco field, during the tobacco-growing season. The total number of determinations amounted to one hundred and forty-seven.

Two hundred and eighteen samples of seeds have been tested with regard to vitality by the laboratory staff.

A very considerable number of determinations have also been made in testing methods, on samples submitted by the Association of Official Agricultural Chemists, and in the preparation of a paper by Mr. Winton, on "Some Conditions Affecting the Accuracy of the Determination of Potash," published in the American Chemical Journal, Vol. XVII, No. 6.

Exclusive of these last mentioned, the total number of analyses made in the chemical laboratory during the year is eleven hundred and seventy-one.

Studies on the Vegetable Proteids.

The work done by Dr. Osborne, with the assistance of Mr. Campbell, may be summarized as follows:

The investigation of diastase, the sugar-forming ferment of sprouting seeds, has been continued and the results obtained are ready for the printer.

A study of the proteids of the potato has been completed.

The proteids of malt have been investigated and the changes of the proteids occurring during germination shown by a comparison with those of ungerminated barley investigated last year.

The proteid substances, described under the name conglutin, the chief nitrogenous constituents of a large number of cattle foods, have been investigated and the conflicting statements of earlier investigators have been cleared up. In this work the seeds of the peach, almond, walnut and hazel nut, have also been studied. These seeds, together with those already examined in this laboratory, have afforded a complete review of the subject of conglutin.

A similar study of the proteid at present known as legumin has been commenced and is well under way, several of the leguminous seeds having been already studied.

The Work of the Mycologist.

Dr. Sturgis, with the aid of Mr. W. H. Olcott at South Manchester, has carried out a field experiment to study the efficacy of the corrosive sublimate treatment of potato seed, where the land which is planted to potatoes is already fully infested with the potato-scab fungus.

In the same experiment the effect on the prevalence of this disease, of application of lime and of stable manure both fresh and composted, has been noted. This work is supplementary to that done last year on the same subject.

A field experiment on the land of Mr. Buckingham, of Southport, and a much smaller one on the Station grounds, have been made to determine how far transplanting onions (on smutty land) is practicable as a means of preventing smut, increasing the yield and hastening maturity.

An experiment on spraying apple trees has been made at Shaker Station.

Much time has also been spent in studies on a blight of melons which has been very destructive in some parts of the State, on a leaf-curl of plums, not hitherto described, on the powdery mildew of grapes, and the shot-hole fungus of plums.

Attention has also been necessarily directed to certain dangerous insect pests.

Specimens of wood sent by an orchardist living near New London from trees which were dying or dead, proved to be affected with the dreaded San José scale. Dr. Sturgis and Mr. Britton immediately visited the orchards, directed the course of treatment to keep the disease in check, till a winter treatment could be used to eradicate it, and a Bulletin was at once issued to call the attention of fruit growers to the subject.

Certain other insect injuries to fruit and ornamental trees have also been studied.

HORTICULTURAL WORK.

Mr. Britton, with the coöperation of Dr. Jenkins, has made a study of the relative availability of different forms of organic nitrogen by vegetation experiments with corn and oats. In addition to the artificial soil used in 1894, two other soils have been used for this work; one a soil on which corn has been raised for five years in succession without fertilizers, the other from a pasture which has been uncultivated for at least thirteen years and has had no fertilizer for the last six years. These vegetation experiments, 137 in number, have been made in galvanized pots and were carried out during the summer season in a house built specially for such purposes.

During the winter a study was begun, in the forcing house, of the fertilizer requirements of the tomato and lettuce crops, and of the growth of these crops with fertilizer chemicals in artificial soils.

Field Experiments.

Under the supervision of Dr. Jenkins, two field experiments have been made to study the effect on the quality, as well as the quantity, of the potato crop, of applications of various potash salts, both with and without lime.

An experiment on bringing worn-out sandy land into arable condition, by the use of chemical fertilizers and leguminous crops, has been begun.

The extensive experiment on the effect of fertilizers on the quality and quantity of the tobacco crop, and the experiment on the growth of maize continuously on the same land, previously noticed in our reports, have been continued this year.

The Grass Garden.

Mr. J. B. Olcott has continued the study of native and foreign turf-making grasses in the Grass Garden at South Manchester. The garden has been considerably enlarged during the year by collections made in England, France, Denmark and Austria by Mr. Olcott.

Station Publications.

The eighteenth report of this Station, for the year 1894, a volume of 296 pages, has been issued in an edition of 12,000 copies, and the 7,000 copies at the disposal of this Station have been distributed, after satisfying our exchanges, among the farmers of Connecticut. Less than 25 copies remain in our hands.

A spraying calendar for the use of Connecticut farmers was issued during March in an edition of 1,800 copies.

Bulletin No. 120, on Analyses of Fertilizers, Trade Values of Fertilizer Ingredients for 1895, and Poultry Foods, containing sixteen pages, was issued in April in an edition of 4,000 copies.

Bulletin 121, on The Elm Leaf Beetle; and the San José Scale; containing sixteen pages, was issued in July, in two editions of 7,000 copies.

These Bulletins are republished in the Annual Report of Station Work for the year.

ATTENDANCE AT FARM INSTITUTES AND OTHER FARMERS' MEETINGS.

In response to request, members of the Station staff have attended a considerable number of meetings of farmers during the year and read papers or made addresses. The time devoted to this work has been equivalent to twenty-four days' time of one man.

CORRESPONDENCE.

During the year 1728 letters have been written by the Station staff and 885 manuscript reports of fertilizer and seed tests have been made.

NEW BUILDINGS.

A forcing house, fifty feet long by twenty feet wide, with a potting room twenty-five feet by ten is now being built and will be used during the coming winter for further experiments on the fertilizer requirements of forcing-house crops.

MEETINGS OF THE BOARD.

During the year ending October 31, the Board of Control has held three meetings.

All of which is respectfully submitted.

WM. H. BREWER, *Secretary.*

Nov. 1st, 1895.

REPORT OF STATION WORK.

A general statement regarding the work done by the Station Staff is to be found on previous pages in the Report of the Board of Control to the Governor.

The following papers present a full and detailed account of the operations of the Station within the twelve month ending October 31, 1895.

It has been found necessary to repeat annually certain statements regarding the fertilizer law and the explanations regarding the analysis and valuation of fertilizers.

FERTILIZERS.

More than 22,500 tons of Commercial Fertilizers are annually brought into Connecticut. This does not include the large quantities of cotton seed meal and cotton hull ashes used in the tobacco-growing sections, nor the unleached Canada ashes used generally throughout the State.

More than $700,000 are annually paid by Connecticut farmers for fertilizers.

In 1883, the year following the passage of the fertilizer law, 38 manufacturers entered 90 brands of fertilizers for sale in the State. The number of brands has increased steadily year by year, while the number of firms doing the fertilizer business has remained about the same.

During the season of 1895 the forty-seven manufacturing firms doing business in the State have entered two hundred and nine brands for sale. These include :

Special manures made for particular crops,	75	brands.
Other nitrogenous superphosphates,	89	"
Bone manures and bone and potash,	28	"
Chemicals, including tankage and castor pomace,	17	"
Total,	209	

THE FERTILIZER LAW OF CONNECTICUT.

The General Assembly, at its session in 1882, passed an Act concerning Commercial Fertilizers which, as amended by an act passed at the session in 1893, is still in force. Copies of those sections of the General Statutes of Connecticut which relate to commercial fertilizers may be had on application to the Station.

Attention is specially called to the following requirements:

1. In case of *all* fertilizers or manures, except stable manure and the products of local manufactures of less value than ten dollars a ton, the law holds the SELLER responsible for *affixing a correct label or statement* to every package or lot sold or offered, as well as for the *payment of an analysis fee* of ten dollars for each fertilizing ingredient which the fertilizer contains or is claimed to contain, *unless* the MANUFACTURER OR IMPORTER has provided labels or statements and has paid the fee. Sections 4005 and 4007.

The Station understands "the fertilizing ingredients" to be those whose determination in an analysis is necessary for a valuation, and which are generally Nitrogen, Phosphoric Acid and Potash. The analysis-fees in case of any fertilizer will therefore usually be ten, twenty or thirty dollars, according as one, two or three of these ingredients are contained or claimed to exist in the fertilizer.

2. The law also requires, *in the case of every commercial fertilizer*, that a *sealed sample* shall be deposited with the Director of the Station by the MANUFACTURER OR IMPORTER, and that a *certified statement* of composition, etc., shall be filed with him. Section 4006.

A statement of the per cent. of Nitrogen, Phosphoric Acid (P_2O_5) and Potash (K_2O), and of their several states or forms, will suffice in most cases. Other ingredients may be named if desired.

In all cases the per cent. of *nitrogen* must be stated. Ammonia may also be given when actually present in ammonia salts, and "ammonia equivalent to nitrogen" may likewise be stated.

The per cent. of soluble and reverted phosphoric acid may be given separately or together, and the term "available" may be used in addition to, but not instead of, soluble and reverted.

The percentage of insoluble phosphoric acid may be stated or omitted.

In case of Bone, Fish, Tankage, Dried Meat, Dried Blood, etc., the chemical composition may take account of the two ingredients: Nitrogen and Phosphoric Acid.

For Potash Salts give always the per cent. of Potash (potassium oxide): that of Sulphate of Potash or Muriate of Potash may also be stated.

The chemical composition of other fertilizers may be given as found in the Station Reports.

3. It is also provided that EVERY PERSON in the State, who sells *any commercial fertilizer of whatever kind or price*, shall annually report certain facts to the Director of the Experiment Station, and on demand of the latter shall deliver a sample for analysis. Section 4008.

4. All "CHEMICALS" that are applied to land, such as Muriate of Potash, Kainite, Sulphate of Potash and Magnesia, Sulphate of Lime (Gypsum or Land Plaster), Sulphate of Ammonia, Nitrate of Potash, Nitrate of Soda, etc.—are considered to come under the law as "Commercial Fertilizers." Dealers in these chemicals must see that packages are suitably labeled. They must also report them to the Station, and see that the analysis fees are duly paid, in order that the Director may be able to discharge his duty as prescribed in Section 4013 of the Act.

It will be noticed that the State exacts no license tax either for making or dealing in fertilizers. For the safety of consumers and the benefit of honest manufacturers and dealers, the State requires that it be known what is offered for sale, and whether fertilizers are what they purport to be. With this object in view the law provides, in Section 4013, that all fertilizers be analyzed, and it requires the parties making or selling them to pay for these analyses in part: the State itself paying in part by maintaining the Experiment Station.

OBSERVANCE OF THE FERTILIZER LAW.

Here follows an alphabetical list of the manufacturers who have paid analysis fees as required by the Fertilizer Law, and the names or brands of the fertilizers for which fees have been paid by them for the year ending May, 1895.

Firm.	*Brand of Fertilizer.*
Alderman, G. B., Suffield, Conn.	Special Potato Fertilizer.
Armour Packing Co., Kansas City, Mo.	Fruit, Vegetable and Tobacco Special.
Baker, H. J. & Bro., 93 William St., New York City.	Special Corn Manure. Special Tobacco Manure. Castor Pomace. A. A. Ammoniated Superphosphate. Complete Onion Manure. Complete Potato Manure. Harvest Home Phosphate.
Bowker Fertilizer Co., 43 Chatham St., Boston, Mass.	Stockbridge Special Tobacco Manure. " " Grain Manure. " " Grass Top-Dressing and Forage Crop Manure. Stockbridge Special Potato and Vegetable Manure. Bowker's Hill and Drill Phosphate. " Farm and Garden Phosphate or Ammoniated Bone Fertilizer. " Potato Manure. " Tobacco Grower. " Sure Crop Bone Phosphate. " Market Garden Manure. " Bone and Potash, Square Brand.
Bradley Fertilizer Co., 92 State St., Boston, Mass.	Bradley's Superphosphate. " Potato Manure. " Complete Manure for Potatoes and Vegetables. " Complete Manure for Top-Dressing Grass and Grain. " Complete Manure for Corn and Grain. " Pure Fine Ground Bone. " Ground Bone and Potash, Circle Brand. " Fish and Potash, Anchor Brand. " Fish and Potash, Triangle A Brand. " B. D. Sea Fowl Guano. " Original Coe's Superphosphate. " Farmer's New Method Fertilizer. " High Grade Tobacco Manure.

Firm.	*Brand of Fertilizer.*
Buckingham, C., Southport, Conn.	A No. 1 Fertilizer.
Chicopee Guano Co., 140 Maiden Lane, New York City.	A 1 Vegetable and Potato Manure.
	Farmer's Reliable.
Church, Daniel T., Tiverton, R. I.	Fish and Potash.
Clark's Cove Fertilizer Co., Farlow Building, State St., Boston, Mass.	Bay State Fertilizer.
	Bay State Fertilizer G. G.
	Potato Manure.
	Great Planet.
	Potato and Tobacco Fertilizer.
	King Philip Guano.
	Fine Ground Bone.
Cleveland Dryer Co., 92 State St., Boston, Mass.	Cleveland Superphosphate.
	" Potato Phosphate.
Coe Co., The E. Frank, 133–137 Front St., New York City.	E. Frank Coe's High Grade Potato Fertilizer.
	E. Frank Coe's High Grade Phosphate.
	" " Alkaline Bone.
	" " Ground Bone and Potash.
Cooper's Glue Factory, Peter, 17 Burling Slip, New York City.	Bone Dust.
Crocker Fertilizer and Chemical Co., Buffalo, N. Y.	Crocker's Special Potato Manure.
	" Practical Ammoniated Superphosphate.
	" Ammoniated Wheat and Corn Superphosphate.
	" Vegetable Bone Superphosphate.
	" New Rival Ammoniated Superphosphate.
	" Pure Ground Bone.
	" Special Conn. Tobacco Manure.
	" Potato, Hop and Tobacco Phosphate.
	" Ammoniated Bone Superphosphate.
Cumberland Bone Phosphate Co., State St. and Merchants Row, Boston, Mass.	Cumberland Superphosphate.
	" Potato Fertilizer.
	" Fertilizer.
	" Concentrated Phosphate.
	" Ground Bone.
Darling Fertilizer Co., The L. B., Pawtucket, R. I.	Potato and Root Crop Manure.
	Animal Fertilizer.
	Garden and Lawn.
	Tobacco Grower.
	Fine Bone.
	Animal "G."
Downes & Griffin, Birmingham, Conn.	Ground Bone.

Firm.	*Brand of Fertilizer.*
Eastern Farm Supply Association, Montclair, N. J.	Carteret Long Island Special.
	" Market Garden Manure.
	" Potato Manure.
Ellsworth, F., Hartford, Conn.	Shoemaker's Swift Sure Bone Meal.
	" " " Superphosphate.
	Collier Castor Pomace.
Great Eastern Fertilizer Co., Rutland, Vermont.	Great Eastern General for Grass and Grain.
	Great Eastern Vegetable, Vine and Tobacco.
	Great Eastern General.
	Soluble Bone and Potash.
Hartford Fertilizer Co., Hartford, Conn.	Bone Meal.
Kelsey, E. R., Branford, Conn.	Bone, Fish and Potash.
Lister's Agricultural Chemical Works, Newark, N. J.	Success Fertilizer.
	Potato Manure.
	Special Potato Fertilizer.
	Special Tobacco Manure.
	Animal Bone and Potash.
	Ammoniated Dissolved Bone Phosphate.
	Standard Pure Bone Superphosphate.
	Crescent Bone Dust.
Ludlam, Frederick, 108 Water St., New York City.	Cereal.
	Cecrops or Dragon's Tooth.
Lyman, Chas. E., Middlefield, Conn.	Corn Manure.
	Potato Manure.
Mapes' Formula and Peruvian Guano Co., 143 Liberty St., New York City.	Potato Manure.
	Complete Manure for General Use.
	Fruit and Vine Manure.
	Corn Manure.
	Fine Bone Dissolved.
	Complete Manure for Light Soils or Vegetable Manure.
	Tobacco Starter.
	Grass and Grain Spring Top-Dressing.
	Complete Manure "A" Brand.
	Tobacco Manure. Wrapper Brand.
	Seeding Down Manure.
Mason, Chapin & Co., Providence, R. I.	Odorless Chemical Compound.
	Odorless Chemical Compound for Tobacco.
	Odorless Chemical Compound for Lawn and Grass.
	Homestead Chemical Compound.
	Homestead Chemical Compound for Tobacco.
	Homestead Chemical Compound for Lawn and Grass.

Firm.	*Brand of Fertilizer.*
Miles, G. W., Milford, Conn.	Ground Fish. IXL Ammoniated Bone Superphosphate.
Miller, Geo. W., Middlefield, Conn.	Unexcelled Phosphate. Ground Bone.
National Fertilizer Co., Bridgeport, Conn.	Chittenden's Complete Fertilizer. " Ammoniated Bone Phosphate. " Fish and Potash. " Ground Bone.
Niagara Fertilizer Works, Buffalo, N. Y.	Niagara Wheat and Corn Producer. " Triumph. " Grass and Grain Grower. " Potato, Tobacco and Hop Fertilizer.
Nuhn, Frederick, Waterbury, Conn.	Self-Recommending Fertilizer.
Olds & Whipple, Hartford, Conn.	O. & W. Special Phosphate. Red Seal Castor Pomace.
Pacific Guano Co., Boston, Mass.	Soluble Pacific Guano. Special Potato Manure. Special for Potatoes and Tobacco. Nobsque Guano. Fine Ground Bone. High Grade General Fertilizer. Pacific Fish and Potash.
Peck Bros., Northfield, Conn.	Pure Ground Bone.
Plumb & Winton, Bridgeport, Conn.	Ground Bone.
Preston Fertilizer Co., Greenpoint, R. I.	Potato Fertilizer. Ammoniated Bone Superphosphate.
Quinnipiac Co., 92 State St., Boston, Mass.	Quinnipiac Phosphate. " Potato Manure. " Market Garden Manure. " Grass Fertilizer. " Corn Manure. " Onion Manure. " Havana Tobacco Fertilizer. " Pure Bone Meal. " Dry Ground Fish. " Pine Island Phosphate. " Fish and Potash, Crossed Fishes Brand. Nitrate of Soda. Muriate of Potash. Double Manure Salts. Sulphate of Potash.
Read Fertilizer Co., Box 3121, New York City.	Read's Standard. High Grade Farmer's Friend. Fish and Potash. Vegetable and Vine.

Firm.	*Brand of Fertilizer.*
Rogers & Hubbard Co., Middletown, Conn.	The Rogers & Hubbard Co's Pure Raw Knuckle Bone Flour.
	The Rogers & Hubbard Co's Pure Raw Knuckle Bone Meal.
	The Rogers & Hubbard Co's Strictly Pure Fine Bone.
	The Rogers & Hubbard Co's Oats and Top-Dressing Fertilizer.
	The Rogers & Hubbard Co's Soluble Potato Manure.
	The Rogers & Hubbard Co's Soluble Tobacco Manure.
	The Rogers & Hubbard Co's Grass and Grain Fertilizer.
	Fairchild's Corn Formula and General Crops.
Rogers Mfg. Co., Rockfall, Conn.	Pure Ground Bone.
	Grass and Grain Fertilizer.
	Soluble Potato and General Crops.
	High Grade Fertilizer for Oats and Top-Dressing.
	Complete Fertilizer.
	High Grade Corn Fertilizer.
Sanderson, L., New Haven, Conn.	Old Reliable Superphosphate.
	Formula A (Complete).
	Pulverized Bone and Meat.
	Blood, Bone and Meat.
	Fine Ground Bone.
	Muriate of Potash.
	High Grade Sulphate of Potash.
	Regular Sulphate of Potash.
	Nitrate of Soda.
	Sulphate of Ammonia.
	Dissolved Bone Black.
Standard Fertilizer Co., Farlow Building, State St., Boston, Mass.	Standard Superphosphate.
	" Fertilizer.
	" Potato and Tobacco Fertilizer.
	" Complete Manure.
	" Guano.
	" Ground Bone.
Walker, Stratman & Co., Pittsburgh, Pa.	Potato Special.
	Smoky City.
	Big Bonanza.
	Four Fold.
Wheeler, M. E. & Co., Rutland, Vermont.	High Grade Potato Manure.
	Electrical Dissolved Bone.
	Grass and Oats Fertilizer.
Wilcox, Leander, Mystic, Conn.	Potato, Onion and Tobacco Manure.
	Ammoniated Bone Phosphate.
	Complete Bone Superphosphate.
	High Grade Fish and Potash.

Firm.	*Brand of Fertilizer.*
Wilkinson & Co., 54 William St., New York City.	Economical Bone Fertilizer.
Williams & Clark Fertilizer Co., 81 Fulton St., New York City.	Americus High Grade Special. " Ammoniated Bone Superphosphate. " Potato Phosphate. " Fine Wrapper Tobacco. " Corn Phosphate. " Potato and Tobacco Fertilizer. Dry Ground Fish Guano. Royal Bone Phosphate. Fish and Potash. Grass Manure. Pure Bone Meal.

SAMPLING AND COLLECTION OF FERTILIZERS.

During April, May and June, Messrs. C. L. Backus of Andover and M. H. Parker of South Coventry, agents of this Station, visited one hundred and six towns and villages of Connecticut to draw samples of Commercial Fertilizers for analysis. These places were distributed as follows:

Litchfield County,	5
Hartford "	27
Tolland "	8
Windham "	11
New London "	9
Middlesex "	14
New Haven "	16
Fairfield "	16
	106

In these places the agents drew 555 samples, representing 199 brands of fertilizers.

In this way one or more samples were secured of nearly every brand of fertilizer which is offered for sale within the State. When several samples of a single brand were drawn in different parts of the State the analysis was performed, not on any single sample, but on a mixture made of an equal weight of each of the several samples. Thus, it is believed, the average composition of the goods is more fairly represented than by the analysis of any single sample.

The Station agents are instructed in every case to open at least three packages of each brand for sampling, and if the number of packages is large, to take a portion from every tenth one, by means of a sampling tube which withdraws a section or core through the entire length of the bag or barrel.

As a rule, the Station will not analyze samples—

1. From dealer's stock of less than one ton.
2. From stock which has lain over from last season.
3. From stock which evidently is improperly stored, as in bags lying on wet ground or exposed to the weather, etc.

The Station desires the coöperation of farmers, farmers' clubs and granges in calling attention to new brands of fertilizers, and in securing samples of all goods offered for sale. All samples drawn by other than Station agents *must be drawn in strict accordance with the Station's Instructions for Sampling, and must also be properly certified,* if the Station analysis is desired. A copy of these instructions and blank certificates will be sent on application.

ANALYSIS OF FERTILIZERS.

During the year, 416 samples of commercial fertilizers and manurial waste-products have been analyzed. A classified list of them is given on page 18.

On a few of these samples analyses were made for private parties and charged for accordingly. A few samples also were analyzed at request of other Experiment Stations in order to compare and test analytical methods. Results of the examination of all the samples, with these exceptions, are given in detail in the following pages.

Samples are analyzed as promptly as possible in the order in which they are received. As soon as an analysis is completed a copy of it is sent to the party who furnished the sample, and also to the manufacturer, in order that there may be opportunity for explanation or protest, before the results are published.

The following "Explanations" are intended to embody the principles and data upon which the valuation of fertilizers is based, a knowledge of which is essential to a correct understanding of the analyses that are given on subsequent pages.

EXPLANATIONS CONCERNING THE ANALYSIS OF FERTILIZERS AND THE VALUATION OF THEIR ACTIVE INGREDIENTS.*

THE ELEMENTS OF FERTILIZERS.

The three chemical elements whose compounds chiefly give value, both commercial and agricultural, to fertilizers are Nitrogen, Phosphorus and Potassium. The other elements found in fertilizers, viz : Sodium, Calcium, Magnesium, Iron, Silicon, Sulphur, Chlorine, Carbon, Hydrogen and Oxygen, which are necessary or advantageous to the growth of vegetation, are either so abundant in the soil or may be so cheaply supplied to crops, that they do not considerably affect either the value or cost of high-priced commercial fertilizers.

NITROGEN in fertilizers is, on the whole, the least abundant of their valuable elements and is, therefore, their most costly ingredient.

Free Nitrogen is universally abundant, making up nearly four-fifths of the common air, and appears to be assimilable, with aid of certain bacteria, by leguminous plants (the clovers, alfalfa, peas, beans, lentils, esparsette, lupins, vetches, lathyrus, peanut, yellow locust, honey locust, etc.), and by a few non-leguminous plants, carrying root-nodules, viz : the Oleasters (*Eleagnus*), the Alders (*Alnus*), and a single family of coniferous trees (*Podacarpus*), but not at all, according to present evidence, by the cereals or other field and garden crops.

Organic Nitrogen is the nitrogen of animal and vegetable matters which is chemically united to carbon, hydrogen and oxygen. Some forms of organic nitrogen, as those of blood, flesh and seeds, are highly active as fertilizers ; others, as found in leather and peat, are comparatively slow in their effect on vegetation, unless these matters are chemically disintegrated. Since organic nitrogen may readily take the form of ammonia, it has been termed *potential ammonia.*

Ammonia (NH_3) *and Nitric Acid* (N_2O_5) are results of the decay of *organic nitrogen* in the soil and manure heap, and contain nitrogen in its most active forms. They occur in commerce—the former in sulphate of ammonia, the latter in nitrate of soda : 17 parts of ammonia or 66 parts of pure sulphate of ammonia contain 14 parts of nitrogen ; 85 parts of pure nitrate of soda also contain 14 parts of nitrogen.

PHOSPHORUS is, next to nitrogen, the most costly ingredient of fertilizers, in which it exists in the form of phosphates, usually those of calcium, iron and aluminum, or in case of "superphosphates," to some extent in the form of free phosphoric acid.

Water-Soluble Phosphoric Acid is phosphoric acid (or a phosphate) that freely dissolves in water. It is the characteristic ingredient of superphosphates, in which it is produced by acting on "insoluble" (or

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* Prepared and revised by the Director.

"citrate soluble") phosphates, with diluted sulphuric acid. Once well incorporated with the soil, it gradually "reverts" and becomes insoluble, or very slightly soluble, in water.

Citrate-soluble Phosphoric Acid signifies the phosphoric acid (of various phosphates) that is freely taken up by a hot strong solution of neutral ammonium citrate, which solution is therefore used in analysis to determine its quantity. The designation *citrate-soluble* is synonymous with the less explicit terms *reverted, reduced* and *precipitated,* which all imply phosphoric acid that was once easily soluble in water, but from chemical change has become insoluble in that liquid.

Recent investigation tends to show that water-soluble and citrate-soluble phosphoric acid are on the whole about equally valuable as plant food, and of nearly equal commercial value. In some cases, indeed, the water-soluble gives better results on crops, in others the "reverted" is superior. In most instances there is probably little to choose between them.

Insoluble Phosphoric Acid implies various phosphates insoluble both in water and in hot solution of neutral ammonium citrate. The phosphoric acid of Canadian "Apatite," of South Carolina and Florida "Rock Phosphate" and of similar dense mineral phosphates, as well as that of "bone-ash" and "bone-black," is mostly insoluble in this sense, and in the majority of cases gives no visible good results when these substances, in the usual ground state, are applied to crops. They contain, however, a small proportion of citrate-soluble phosphoric acid, and sometimes, when they are reduced to extremely fine dust (floats) or applied in large quantities, especially on "sour soils" or in conjunction with abundance of decaying vegetable matter (humus), they operate as efficient fertilizers.

Available Phosphoric Acid is an expression properly employed in general to signify phosphoric acid in any form, or phosphates of any kind that serve to nourish vegetation. In the soil phosphoric acid and all phosphates, whatever their solubilities as defined in the foregoing paragraphs, are more or less freely and extensively available to growing plants. Great abundance of "insoluble" phosphoric acid may serve crops equally well with great solubility of a small supply, especially when the soil and the crop carry with them conditions highly favorable to the assimilation of plant food.

In Commercial Fertilizers, "available phosphoric acid" is frequently understood to be the sum total of the "water-soluble" and the "citrate-soluble," with exclusion of the "insoluble."

The "insoluble phosphoric acid" in a commercial fertilizer costing $20 to $50 per ton has very little or no value to the purchaser, because the quantity of it which can commonly go upon an acre of land has no perceptible effect on the crop, and because its presence in the fertilizer excludes an equal percentage of more needful and much more valuable ingredients.

In Raw Bone the phosphoric acid (calcium phosphate) is nearly insoluble, because of the animal matter of the bones which envelops it;

but when the animal matter decays in the soil, or when it is disintegrated by boiling or steaming, the phosphate mostly remains in an available form. The phosphoric acid of "Basic-Slag" and of "Grand Cayman's Phosphate" is in some soils as freely taken up by crops as water-soluble phosphoric acid, but in other soils is much less available than the latter.

Phosphoric acid in all the Station analyses is reckoned as "anhydrous phosphoric acid" (P_2O_5), also termed among chemists phosphoric anhydride, phosphoric oxide, and phosphorus pentoxide.

POTASSIUM is the constituent of fertilizers which ranks third in costliness. In plants, soils and fertilizers, it exists in the form of various salts, such as chloride (muriate), sulphate, carbonate, nitrate, silicate, etc. Potassium itself is scarcely known except as a chemical curiosity.

Potash signifies the substance known in chemistry as potassium oxide (K_2O), which is reckoned as the valuable fertilizing ingredient of "potashes" and "potash salts." In these it should be freely soluble in water and is most costly in the form of sulphate, and cheapest in the form of muriate (potassium chloride). In unleached wood-ashes it exists mainly as potassium carbonate.

VALUATION OF FERTILIZERS.

The valuation of a fertilizer, as practised at this Station, consists in calculating the *retail Trade-value* or *cash-cost* (in raw material of good quality) of an amount of nitrogen, phosphoric acid and potash equal to that contained in one ton of the fertilizer.

Plaster, lime, stable manure and nearly all of the less expensive fertilizers have variable prices, which bear no close relation to their chemical composition, but guanos, superphosphates and similar articles, for which $30 to $50 per ton are paid, depend for their trade-value exclusively on the substances *nitrogen*, *phosphoric acid* and *potash*, which are comparatively costly and steady in price. The trade-value per pound of these ingredients is reckoned from the current market prices of the standard articles which furnish them to commerce.

The consumer, in estimating the reasonable price to pay for high-grade fertilizers, should add to the *Trade-value of the above named ingredients* a suitable margin for the expenses of manufacture, etc., and for the convenience or other advantage incidental to their use.

TRADE-VALUE OF FERTILIZER ELEMENTS, FOR 1895.*

The average Trade-values or retail costs in market, per pound, of the ordinarily occurring forms of nitrogen, phosphoric acid and potash in raw materials and chemicals, as found in New England, New York and New Jersey markets during 1894, were as follows:

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* Adopted at a conference of representatives of the Connecticut, Massachusetts, New Jersey and Rhode Island Stations held in March, 1895.

	Cts. per lb.
Nitrogen in ammonia salts	18½
nitrates	15
Organic nitrogen in dry and fine ground fish, meat and blood and in mixed fertilizers	16½
in cotton seed meal	12
in fine bone and tankage	16
in fine-medium bone and tankage	14
in medium bone and tankage	11
in coarser bone and tankage	5
Phosphoric acid, water-soluble	6
citrate-soluble*	5½
of dry ground fine fish, bone and tankage	5½
of fine-medium bone and tankage	4½
of medium bone and tankage	3
of coarse bone and tankage	2
of fine ground fish, cotton seed meal, castor pomace and wood ashes	5
of mixed fertilizers insoluble in ammonium citrate	2
Potash as high-grade sulphate and in forms free from muriate (or chlorides)	5¼
as muriate	4½

The foregoing are, as nearly as can be estimated, the prices at which, during the six months preceding March last, the respective ingredients were retailed for cash, in our large markets, in those *raw materials* which are the regular source of supply. They also correspond to the average wholesale price for the six months ending March 1st, plus about 20 per cent. in case of goods for which we have wholesale quotations. The valuations obtained by use of the above figures will be found to correspond fairly with the *average retail prices* at the large markets of standard raw materials, such as :

Sulphate of Ammonia,
Nitrate of Soda,
Dried Blood,
Azotin,
Ammonite,
Muriate of Potash,
Sulphate of Potash,
Plain Superphosphates,
Dry Ground Fish,
Bones and Tankage,
Ground South Carolina Rock.

*Dissolved from 2 grams of the fertilizer, previously extracted with pure water, by 100 c.c. neutral solution of ammonium citrate, sp. gr. 1.09, in 30 minutes, at 65° C., with agitation once in five minutes. Commonly called "reverted" or "backgone" Phosphoric Acid.

VALUATION OF SUPERPHOSPHATES, SPECIAL MANURES AND MIXED FERTILIZERS OF HIGH GRADE.

The Organic Nitrogen in these classes of goods is reckoned at the price of nitrogen in raw materials of the best quality, 18½ cents.

Insoluble Phosphoric Acid is reckoned at 2 cents per pound. Potash is rated at 4½ cents, if sufficient chlorine is present in the fertilizer to combine with it to make muriate. If there is more Potash present than will combine with the chlorine, then this excess of Potash is reckoned at 5¼ cents per pound.

In most cases the valuation of the ingredients in superphosphates and specials falls below the retail price of these goods. The difference between the two figures represents the manufacturer's charges for converting raw materials into manufactured articles and selling them. The charges are for grinding and mixing, bagging or barreling, storage and transportation, commission to agents and dealers, long credits, interest on investments, bad debts and, finally, profits.

The majority of the manufacturers agree that the average cost of mixing, bagging, handling and cartage ranges from $3.00 to $4.50 per ton.

In 1895 the average selling price of Ammoniated Superphosphate and Guanos was $32.32 per ton, the average valuation was $23.37 and the difference $8.95, an advance of 38.2 per cent. on the valuation and on the wholesale cost of the fertilizing elements in the raw materials.

In case of Special manures the average cost was $37.33, the average valuation $27.94 and the difference $9.39 or 33.6 per cent. advance on the valuation.

To obtain the Valuation of a Fertilizer we multiply the pounds per ton of nitrogen, etc., by the trade-value per pound. We thus get the values per ton of the several ingredients, and adding them together we obtain the total valuation per ton.

In case of *Ground Bone*, the sample is sifted into four grades and we separately compute the nitrogen-value of each grade by multiplying the pounds of nitrogen per ton by the per cent. of each grade, taking $\frac{1}{100}$th of that product, multiplying it by the trade-value per pound of nitrogen in that grade, and taking this final product as the result in cents. Summing up the separate values of each grade thus obtained, together with the values of each grade of phosphoric acid, similarly computed, the total is the Valuation of the sample of bone.

USES AND LIMITATIONS OF FERTILIZER VALUATION.

The uses of the "Valuation" are two-fold:

1. To show whether a given lot or brand of fertilizers is worth, as a commodity of trade, what it costs. If the selling price is not higher than the valuation, the purchaser may be tolerably sure that the price is reasonable. If the selling price is twenty to twenty-five per cent. higher than the valuation, it may still be a fair price; but in proportion as the cost per ton exceeds the valuation there is reason to doubt the economy of its purchase.

2. Comparisons of the valuation and selling prices of a number of similar fertilizers will generally indicate fairly which is the best for the money.

But the valuation is not to be too literally construed, for in some cases analysis cannot discriminate positively between the active and the inert forms of nitrogen, while the mechanical condition of a fertilizer is an item whose influence cannot always be rightly expressed or appreciated.

For the above first-named purpose of valuation, the trade-values of the fertilizing elements which are employed in the computations should be as exact as possible, and should be frequently corrected to follow the changes of the market.

For the second named use of valuation frequent changes of the trade-value are disadvantageous, because two fertilizers cannot be compared as to their relative money-worth, when their valuations are deduced from different data.

Experience leads to the conclusion that the trade-values adopted at the beginning of the year should be adhered to as nearly as possible throughout the year, notice being taken of considerable changes in the market, in order that due allowance may be made therefor.

AGRICULTURAL VALUE OF FERTILIZERS.

The Agricultural Value of a fertilizer is measured by the benefits received from its use, and depends upon its fertilizing effect, or crop-producing power. As a broad, general rule, it is true that ground bone superphosphates, fish-scraps, dried blood, potash salts, etc., have a high agricultural value which is related to their trade-value, and to a degree determines the latter value. But the rule has many exceptions, and in particular instances the trade-value cannot always be expected to fix or even to indicate the agricultural value. Fertilizing effect depends largely upon soil, crop and weather, and as these vary from place to place, and from year to year, it cannot be foretold or estimated except by the results of past experience, and then only in a general and probable manner.

CLASSIFICATION OF FERTILIZERS ANALYZED.

RAW MATERIALS.

1. *Containing Nitrogen as the Chief Valuable Ingredient.*

Nitrate of Soda	9
Dried Blood	1
Horn and Hoof	1
Leather	5
Cotton Seed Meal	30
Castor Pomace	7

2. *Containing Phosphoric Acid as the Chief Valuable Ingredient.*

Rock Phosphate	2
Odorless Mineral Guano	1
Dissolved Bone Black	4
Dissolved Rock Phosphate	11

3. *Containing Potash as the Chief Valuable Ingredient.*

High Grade Sulphate of Potash	2
Double Sulphate of Potash and Magnesia	3
Muriate of Potash	7
Saltpeter Waste	2

4. *Containing Nitrogen and Phosphoric Acid.*

Bone Manures	34
Tankage	11
Fish	8

MIXED FERTILIZERS.

Bone and Potash	8
Nitrogenous Superphosphates and Guanos	106
Special Manures	101

MISCELLANEOUS FERTILIZERS AND MANURES.

Cotton Hull Ashes	23
Wood Ashes	17
Home Mixtures	15
Muck	4
Marine Mud	2
Beef Scraps	1
Anthracite Ashes	1
Total	416

DESCRIPTION AND ANALYSES OF FERTILIZERS.*

I. RAW MATERIALS CHIEFLY VALUABLE FOR NITROGEN.

NITRATE OF SODA OR SODIUM NITRATE.

Nitrate of Soda is mined in Chili and purified there before shipment. It contains about 16 per cent. of nitrogen, equivalent to 97 per cent. of pure sodium nitrate. The usual guarantee is "96 per cent." of sodium nitrate, equivalent to 15.8 per cent. of nitrogen.

4511. Sold by National Fertilizer Co., of Bridgeport, to S. E. Curtis, Stratford, and sampled by him.

4489. Sold by National Fertilizer Co., to T. J. Stroud, Shaker Station, and sampled by him.

4777. Sold for Quinnipiac Co. Boston. Stock of Olds & Whipple, Hartford.

4926. Stock of Olds & Whipple, Hartford. Sampled and sent by P. P. Hickey, Burnside.

4762. Sold by Read Co., of New York, to A. Wetmore, Litchfield, and sampled by Milo D. Beach, Litchfield.

4778. Sold by L. Sanderson, New Haven.

4629. Bought of New York broker by J. Norris Barnes, Yalesville, and sampled by him.

ANALYSES.

	4511	4489	4777	4926	4762	4778	4629
Moisture	.21	.94	2.10	4.25	1.26	1.77	2.05
Insoluble in water	.17	.20	.30	2.37	.21	.40	.00
Common Salt	.13	.20	.98	.79	.45	.99	.86
Sodium Sulphate	.27	.23	.37	2.12	.12	.27	.33
Sodium Nitrate	99.22	98.43	96.25	90.47	97.96	96.57	96.76
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Equivalent Nitrogen	16.37	16.24	15.88	14.92	16.15	15.93	15.95
Cost per ton	$50.00§	50.00	50.00	55.00	48.20†	50.00	39.60‡
Nitrogen costs cents per pound	**15.2**	**15.4**	**15.7**	**18.4**	**14.9**	**15.7**	**12.5**

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* This chapter, pages 19 to 74, has been prepared for publication by Dr. Jenkins. The analyses of fertilizers have been made by Messrs. Winton and Ogden with the constant assistance of Mr. Lange.

† Wholesale, at Litchfield.

‡ In car lot at Yalesville.

§ The prices given are regular retail rates unless otherwise stated.

Sample **4926** is of inferior quality. It contains several per cent. more of moisture, sand and other impurities than the other samples, and correspondingly less nitrogen.

The samples **4511** and **4489** were drier than the average, and in consequence the per cent. of nitrogen was higher. The others are of average quality, and the average retail price for the season has been about 15½ cents per pound of nitrogen.

DRIED BLOOD.

This consists of slaughter-house blood which has been dried by superheated steam or hot air. It is a finely pulverized, nearly odorless substance, red or dark red in color, and rich in nitrogen that is quickly available to vegetation.

4544. Purchased of L. Sanderson, New Haven, for vegetation experiments. The material contained 13.40 per cent. of nitrogen and 1.54 of phosphoric acid and cost $40.00 per ton, making the cost of nitrogen 14.4 cents per pound.

PREPARATIONS OF LEATHER.

As has been proved abundantly by experiment, leather, whether in its untreated state or steamed or roasted, and pulverized, has no value as a fertilizer. The State fertilizer law wisely forbids its use in any form as an ingredient of commercial fertilizers without explicit printed certificate of the fact, "such certificate to be conspicuously affixed to every package," etc.

The materials on which the following analyses were made were used in vegetation experiments to be described on following pages.

4565. Ground leather, imported from England, for use as a cheap "ammoniate" in mixed fertilizers. The method of manufacture is unknown. It is a brownish black powder, in appearance resembling dried blood. When pulverized it emits an odor of benzine.

4581. Hemlock-tanned sole leather.

4622. Steamed leather prepared from **4581** by heating over water in the autoclave for 1¾ hours at a pressure of 58 pounds to the square inch, and drying the gummy product in the water-bath.

4623. Roasted leather prepared from **4581** by heating the powdered leather at 240° C. for four hours.

4625. Dissolved leather. 148 grams of samples **4581** and 100 grams of oil of vitriol, sp. gr. 1.84, were heated gradually, with constant stirring, till fumes of sulphurous acid appeared. Water was added and the mass digested, evaporated to dryness, and heated till sulphurous acid was evolved. Water was again added, the acid was nearly neutralized with carbonate of lime, and the whole dried on the water-bath.

ANALYSES.

	From England.	Sole Leather.	Steamed Leather.	Roasted Leather.	Dissolved Leather.
	4565	**4581**	**4622**	**4623**	**4625**
Nitrogen........	7.39	6.76	6.21	8.54	2.81

COTTON SEED MEAL.

This material is of two kinds, which are known in trade respectively as undecorticated and decorticated. In their manufacture cotton seed is first ginned to remove most of the fiber, then passed through a "linter" to take off the short fiber or lint remaining, then through machines which break and separate the hulls. The hulled seed is ground and the oil expressed. The ground cake from the presses is used as a cattle food and fertilizer. The hulls are burned for fuel in the oil factory and the ashes, which contain from 20 to 30 per cent. of potash, are also used as a fertilizer. In case of undecorticated meal the hulls and the ground press-cake are mixed together.

Nitrogen alone has been determined in most of the samples whose analyses follow. In those cases the per cents. of phosphoric acid and potash given in the table are the averages derived from all the analyses of decorticated meal made in the last two years at this Station. The per cent. amounts of phosphoric acid and potash in clear cotton seed meal do not vary so much in different samples as to make their determination necessary in order to determine the general quality of the sample.

Two of the samples, **4604** and **4466**, consist of undecorticated meal, containing only about four per cent. of nitrogen. The purchase of this low grade meal, at present prices, is not economical.

The average cost of nitrogen per pound in the twenty-five samples was 11.2 cents; the lowest price paid was 8.6 cents, the highest 13.5.

Cotton seed meal has been by far the cheapest source of available nitrogen, during the past season. Experiments indicate that it is as rapidly and fully available as the best forms of animal matter. It has been extensively used this year in home-mixed fertilizers and has given perfect satisfaction.

ANALYSES OF COTTON SEED MEAL.

Station No.	Dealer.	Sampled by	Nitrogen.	Phosphoric Acid.	Potash.	Cost per Ton.	Nitrogen costs cents per pound.
4508	Not stated	Station agent, from stock of S. D. Woodruff & Sons, Orange.	8.32	2.42	1.69	$18.50	**8.6**
4767	Noble Bennett, New Milford	Noble Bennett, New Milford	6.81	2.81	1.85	18.00	**9.7**
4665	Abner Hendee, New Haven	Station agent, stock of J. H. Webb, Hamden	7.16	2.81	1.85	18.75	**9.8**
4810	Olds & Whipple, Hartford	C. J. Dewey, stock of Wilbur Hills, Buckland	6.97	2.81	1.85	18.50	**9.8**
4708	James Perkins, Suffield	F. B. Hathaway, Suffield	6.98	2.81	1.85	18.50	**9.8**
4550	C. M. Cox & Co., Boston, Mass.	C. J. Dewey, Buckland	7.20	2.81	1.85	19.00	**9.9**
4765	B. C. Patterson, Torrington	Milo D. Beach, Litchfield	8.08	2.81	1.85	21.00	**10.0**
4811	August Pouleur, Windsor	L L. Bedortha, Windsor	6.93	2.81	1.85	19.00	**10.2**
4498	Abner Hendee, New Haven	Station agent, stock J. H. Webb, Hamden	7.76	2.81	1.85	21.00	**10.4**
4707	W. S. Pinney, Suffield	S. Seymour, Windsor Locks	6.80	2.81	1.85	19.00	**10.5**
4569	F. L. Worthy & Co., Mittineague, Mass	David L. Brockett, Suffield	7.70	2.81	1.85	21.25	**10.7**
4503	H. K. Brainard, Thompsonville	E. N. Barnes, Thompsonville	7.08	2.81	1.85	20.50	**11.1**
4735	Abner Hendee, New Haven	H C. C. Miles, Milford	7.00	2.81	1.85	21.00	**11.6**
4509	Not stated	S. E. Curtis, Stratford	6.96	2.81	1.85	21.00	**11.7**
4589	Olds & Whipple, Hartford	T. W. Lester, Windsor Locks	7.12	2.81	1.85	21.50	**11.7**
4583	Olds & Whipple, Hartford	Wm. S. Pinney, Suffield	6.38	2.81	1.85	19.00	**12.0**
4709	Olds & Whipple, Hartford	P. P. Hickey, Burnside	6.96	2.81	1.85	21.50	**12.0**
4570	F. L. Worthy & Co. Mittineague, Mass.	David L. Brockett, Suffield	6.55	2.81	1.85	20.00	**12.0**
4481	A. E. Arnold	Wm. W. Thompson, Warehouse Point	7.90	2.06	1.73	23.00	**12.1**
4495	R. A. Parker, Warehouse Point	Wm. W. Thompson, Warehouse Point	7.28	2.81	1.85	22.50	**12.2**
4522	Olds & Whipple, Hartford	H. V. Griffin, East Granby	6.96	2.81	1.85	22.00	**12.4**
4497	Not stated	S. E. Curtis, Stratford	6.56	2.81	1.85	21.00	**12.4**
4480	J. M. Williams, Manchester	W. H. Olcott, So. Manchester	6.87	3.15	2.01	23.00	**12.9**
4502	Olds & Whipple, Hartford	G. S. Phelps, Warehouse Point	6.79	2.81	1.85	23.00	**13.4**
4675	For Tobacco Experiment	Station agent	6.65	2.35	1.73	22.00	**13.5**
4604	N. C. Hall & Co., New Haven	James H. Webb, Hamden	4.0	----	----	15.00	----
4560	F. A. Betts, New Haven		8.40	----	----	----	----
4466	Not stated	F. Ellsworth, Hartford	4.10	----	----	----	----
4494	Not stated	S. O. Griswold, Windsor	7.21	----	----	----	----
4591	Not stated	Miss M. A. Neale, Southington	8.59	----	----	----	----

CASTOR POMACE.

This is the ground residue of castor beans from which castor oil has been extracted. It is an excellent fertilizer, but extremely poisonous to animals, which often eat it greedily when the opportunity offers.

4893. Made by H. J. Baker & Bro., N. Y. From stock of Edmund Halliday, Suffield.

4738. Made by H. J. Baker & Bro. Sampled and sent by Francis Granger, East Granby.

4895. Made by Collier Co., St. Louis, Mo. Stock of F. Ellsworth, Hartford.

4545. Made by Collier Co. Stock of F. Ellsworth. Stock of 1894.

4894. Made by Red Seal Castor Oil Co., St. Louis, Mo. From stock of Olds & Whipple, Hartford.

4546. Made by Red Seal Castor Oil Co. From stock of Olds & Whipple. Stock of 1894.

4676. Bought of Bowker Fertilizer Co., Boston, for the Tobacco Experiment Co.

ANALYSES.

	4893	4738	4895	4545	4894	4546	4676
Nitrogen	4.56	4.42	5.50	4.78	4.78	4.98	5.04
Phosphoric Acid	1.71	----	1.69	----	1.87	----	4.18
Potash	1.16	----	.93	----	.93	----	1.81
Cost per Ton	$18.50		19.00		20.00		15.00
Nitrogen costs cents per pound	17		14.7		17.9		8.8

The per cents. of phosphoric acid and potash in sample 4676 are abnormally large for this material.

Castor Pomace is an expensive form of organic nitrogen at present prices and is used chiefly by certain tobacco growers who still prefer it to cotton seed meal. The Poquonock experiments indicate that cotton seed meal in equivalent quantity yields tobacco of the same quality in all respects as castor pomace, and at a much lower cost for fertilizers.

II. RAW MATERIALS OF HIGH GRADE CONTAINING PHOSPHORIC ACID AS THE CHIEF VALUABLE INGREDIENT.

ODORLESS MINERAL GUANO.

4499. This material, sold by the Forest City Ash Co., Boston, Mass., sampled and sent by T. J. Stroud, Shaker Station, is stated by the agents to be a Florida Soft Phosphate.

It contained 20.52 per cent. of phosphoric acid, of which 18.73 per cent. was insoluble in water and ammonium citrate.

DISSOLVED BONE BLACK AND DISSOLVED ROCK PHOSPHATE.

Dissolved Bone Black.

Bone Black, made by subjecting bone to a red heat without access of air, is used in sugar refineries to decolorize sugar solutions. The waste bone black dried, and treated with oil of vitriol, makes a "superphosphate" of high grade which does not cake together on standing, but remains as a fine powder suitable for application to the land.

4780. Stock of L. Sanderson, New Haven.

4638. Stock of Leander Wilcox, sampled and sent by Lawrence Daily, East Windsor Hill.

4661. Sold by Mapes' F. & P. G. Co. in 1894.

4662. Sold by L. Sanderson in 1893. The two last were sent by Prof. C. J. Phelps, of the Storrs Agricultural College.

See table of analyses, page 26.

Dissolved Rock Phosphate or Acid Rock.

This material, made by treating various mineral phosphates with oil of vitriol, is the most common source of the phosphoric acid of factory-mixed fertilizers.

The per cent. of phosphoric acid in a fertilizer multiplied by 2.18 gives the amount of tricalcium phosphate or so-called "bone phosphate," which figures in commercial transactions but does not signify that the phosphate is derived from bone.

4507. Made by Liebig Manufacturing Co., Cartaret, N. J. From stock bought by S. D. Woodruff & Sons, Orange.

4493. Made by Liebig M'f'g Co. Sample sent by manufacturer.

4513. Sold by National Fertilizer Co., Bridgeport. Sampled and sent by S. E. Curtis, Stratford.

4490. Sold by National Fertilizer Co. Sampled and sent by T. J. Stroud, Shaker Station.

4764. Read's Dissolved Bone. Made by Read Fertilizer Co., N. Y. Stock of A. Wetmore, Litchfield. Sampled and sent by Milo D. Beach, Litchfield.

4664. Sold by L. Sanderson, New Haven, from stock bought by J. H. Webb, Hamden.

4736. Sold by G. F. Taylor and Brush, New York City. Sampled and sent by H. C. C. Miles, Milford.

4628. Bought from New York broker. Sampled and sent by J. Norris Barnes, Yalesville.

4875. Electrical Dissolved Bone. Made by M. E. Wheeler & Co., Rutland, Vt. Sampled from stock of P. B. Moffit, Pomfret, and Wm. M. Owen, North Haven.

See table of analyses, page 26.

In acid rock phosphate available phosphoric acid has cost on the average very considerably less than in dissolved bone black. Those who have tried the acid phosphate in home-mixed fertilizers report very favorably, finding little or no trouble from caking or "setting" after mixing. There is no reason in the claim that the "available" phosphoric acid of the dissolved rock phosphates is any less valuable agriculturally than that of dissolved bone black. See further remarks on this subject, on pages 64 and 65.

III. Raw Materials of High Grade containing Potash.

High Grade Sulphate of Potash.

This chemical should contain over 90 per cent. of pure potassium sulphate (sulphate of potash) or about fifty per cent. of potassium oxide, the same quantity as is supplied by muriate, and should be nearly free from chlorine.

4728. Sold by the Quinnipiac Co. Sampled from stock of Olds & Whipple, Hartford.

4670. Sold by L. Sanderson, New Haven. Sampled from stock bought by Conn. Tobacco Experiment Co.

(For analyses see table on page 28.)

Double Sulphate of Potash and Magnesia.

This material is usually sold as "sulphate of potash" or "manure salt," on a guarantee of "48–50 per cent. sulphate," which is equivalent to 25.9–27.0 per cent. of potassium oxide. Besides

ANALYSES.

	4780	**4638**	**4661**	**4662**	**4507**	**4493**	**4513**	**4490**	**4764**	**4664**	**4736**	**4628**	**4875**
Soluble phosphoric acid	16.29	16.67	16.11	16.46	8.58	13.00	8.35	12.83	5.74	11.31	12.34	9.86	7.65
Reverted phosphoric acid	.32	none.	.37	1.08	6.34	2.92	6.85	2.93	7.02	2.78	2.67	5.92	6.35
Insoluble phosphoric acid	.06	none.	.06	.18	1.47	.15	2.01	1.15	1.43	.40	1.11	.60	.53
Cost per ton	$26.00	26.00	----	----	11.50*	----	15.00	18.00	16.20‡	----	13.00	10.20†	24.00
"Available" phosphoric acid costs per pound	**7.8**	**7.8**	----	----	**3·9**	----	**4·9**	**5·7**	**6.1**	----	**4.1**	**3·3**	**8.6**

* Car lot in Orange. † Car lot in Yalesville. ‡ Wholesale in Litchfield.

some 46–50 per cent. of potassium sulphate, it contains over 30 per cent. of magnesium sulphate, chlorine equivalent to 3 per cent. of common salt, a little sodium and calcium sulphates, with varying quantities of moisture.

4727. Sold by Quinnipiac Co., Boston. Sampled from stock of Olds & Whipple, Hartford.

4779. Sold by L. Sanderson, New Haven. Sampled from stock of Clifton Peck, Lebanon.

4672. Sold by L. Sanderson. Sampled from stock bought by the Conn. Tobacco Experiment Co.

(For analyses see table on next page.)

MURIATE OF POTASH.

Commercial muriate of potash contains about 80 per cent. of muriate of potash (potassium chloride), 15 per cent. or more of common salt (sodium chloride), and 4 per cent. or more of water.

It is generally retailed on a guarantee of 80 per cent. muriate, which is equivalent to 50.5 per cent. of potassium oxide.

4701. Sold by Cumberland Bone Phosphate Co., Boston. Sampled and sent by D. C. Spencer, Saybrook.

4512. Sold by National Fertilizer Co., Bridgeport. Sampled and sent by S. E. Curtis, Stratford.

4892. Sold by Quinnipiac Co., Boston. Sampled from stock of O. S. Olmstead, Melrose.

4763. Sold by Read Fertilizer Co., N. Y. Sampled and sent by Milo D. Beach, Litchfield.

4666. Sold by L. Sanderson, New Haven. Sampled from stock bought by J. H. Webb, Hamden.

4506. Sampled from stock bought of a N. Y. broker by S. D. Woodruff & Sons, Orange.

4630. Sampled from stock bought of a N. Y. broker by J. Norris Barnes, Yalesville.

The analyses show the usual variations in composition. The Quinnipiac Co. has protested that analysis No. **4892** does not fairly represent the quality of the muriate sold by them, which contains a larger per cent. of potash than is shown by that analysis. The Station was unable to find other samples in market on which to make further analyses.

Potash in the sulphates, both high and low grade, has cost about one cent more per pound than in the muriates.

Analyses of Potash Salts.

	High grade Sulphates.		Double Sulphates.			Muriates.						
	4728	**4670**	**4727**	**4779**	**4672**	**4701**	**4512**	**4892**	**4763**	**4666**	**4506**	**4630**
Actual Potash	47.36	50.39	26.95	28.12	28.39	49.78	50.73	50.07	50.60	50.30	49.77	51.03
Equivalent Sulphate	87.6	93.2	49.9	52.0	52.5	----	----	----	----	----	----	----
Equivalent Muriate	----	----	----	----	----	78.6	80.1	79.0	79.9	79.5	78.6	80.6
Cost per ton	$55.00	50.00	32.00	30.00	30.00	45.00	41.00	45.00	46.20	42.50	41.60†	40.60*
Actual potash costs cents per pound	5·8	4·9	5·9	5·3	5·3	4·5	4·0	4·4	4·5	4·2	4·2	3·8

* Car lot in Yalesville.

† Car lot.

SALTPETER WASTE.

Two samples of this material, **4542** light-colored, and **4543** dark colored, both from stock of Taylor & Brush, New York City, were sent for analysis by A. E. Plant, Branford.

ANALYSES.

	4542.	**4543.**
Nitrogen as nitrate	Trace.	.16
Potash	3.80	3.52

The material is for the most part salt. The amount of potash in a ton of it can be bought in form of muriate for about $3.00.

IV. RAW MATERIALS CONTAINING NITROGEN AND PHOSPHORIC ACID.

BONE MANURES.

The terms "Bone Dust," "Ground Bone," Bone Meal" and "Bone" applied to fertilizers, sometimes signify material made from dry, clean and pure bones; in other cases these terms refer to the result of crushing fresh or moist bones which have been thrown out either raw or after cooking, with more or less meat, tendon, and grease and—if taken from garbage or ash heaps—with ashes or soil adhering; again they denote mixtures of bone, blood, meat and other slaughter-house refuse which have been cooked in steam-tanks to recover grease, and are then dried and sometimes sold as "tankage;" or, finally, they apply to bone from which a large share of the nitrogenous substance has been extracted in the glue manufacture. The nitrogen of all these varieties of bone when they are in the same state of mechanical subdivision has essentially the same fertilizing value.

The method adopted for the valuation of bone manures, which takes account of their mechanical condition as well as chemical composition, is fully explained on page 16.

1. *Sampled by Station Agents.*

On pages 31 and 32 are tabulated twenty-five analyses of this class of bone manures.

In case a brand has sold at two or more different prices, the manufacturer's price, when known, has been used in calculating percentage difference.

Otherwise an average, or nearly average price forms the basis of comparison between cost and valuation. The price thus employed is printed in heavy-faced type.

The Hartford Fertilizer Co. protested that analysis No. **4890** did not fairly represent their goods and was made on goods manufactured in the previous season. Another sample of the same brand, No. **4924,** was accordingly drawn and analyzed. It proved to be quite similar to the other in chemical composition, but was mechanically much finer.

The Rogers & Hubbard Co. protested that analysis No. **4773** of their Strictly Pure Fine Bone did not fairly represent its mechanical condition, and that the same brand for the last six years had shown a much finer state of pulverization. Accordingly another sample of the same brand, No. **4923,** was drawn and analyzed. It proved to be considerably finer than the sample previously examined and agreed with the average of the analyses of the last six years.

Sample **4882** was sent as Nuhn's Self-Recommending Fertilizer. This brand, however, is understood to contain potash.

COST AND VALUATION.

The average cost per ton of the twenty-four brands of bone manures analyzed has been $32.09, and the average valuation $31.03 per ton.

2. *Sampled by manufacturers; and* 3. *Sampled by consumers.*

Sample **4889,** deposited at the Station by the manufacturer in compliance with the law, was analyzed to meet the requirement of the law which calls for an annual analysis of each brand. The sampling agents of the Station did not succeed in finding this brand on sale in the State.

The other samples described below were sent in by private parties and this Station is not responsible for the accuracy of the sampling. The Station holds, however, in each case a written certificate that the sample was drawn in accordance with its printed instructions.

2. *Sampled by Manufacturers.*

4889. Crescent Bone Dust. Made by Lister's Agricultural Chemical Works, Newark, N. J.

BONE MANURES SAMPLED BY STATION AGENT.

Station No.	Name or Brand.	Manufacturer.	Dealer	Dealer's Cash Price per Ton.	Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Chemical Analysis.		Mechanical Analysis.			
									Finer than			
							Nitrogen.	Phos. Acid.	$\frac{1}{50}$ inch.	$\frac{1}{25}$ inch.	$\frac{1}{12}$ inch.	Coarser than $\frac{1}{12}$ inch.
						Valuation exceeds cost.						
4899	Bone Meal.	Danbury Fertilizer Co., Danbury.	E. Baker, Green's Farms.	**$27.00**	$36.72	26.4	3.96	24.14	70	24	6	--
			Manufacturer.	30.00	----	----	----	----	--	--	--	--
4924	Bone Meal.	Hartford Fertilizer Co., Hartford.	Manufacturer.	**25.00**	32.56†	23.2	2.45	25.73	71	15	7	7
4898	Chittenden's Ground Bone.	National Fertilizer Co., Bridgeport.	H. M. Ives, West Cheshire.	**30.00**	36.38	17.5	3.08	26.55	70	20	10	--
4711	Peter Cooper's Bone.	Peter Cooper's Glue Factory, New York City.	George Beaumont, Wallingford.	**28.00**	29.93	6.4	2.22	27.68	52	15	16	17
4669	Peter Cooper's Bone.	Peter Cooper's Glue Factory, New York City.	George Beaumont, Wallingford.*	**28.00**	----	----	2.24	26.65	--	--	--	--
4613	Bone Meal.	Quinnipiac Co., Boston, Mass.	F. M. Raymond, Westport.	**30.00**	31.70	5.4	3.38	22.94	55	26	19	--
4775	Fine Ground Bone.	L. Sanderson, New Haven.	Clifton Peck, Lebanon.	**33.00**	34.48	4.2	4.16	24.64	44	33	23	--
4890	Bone Meal.	Hartford Fertilizer Co., Hartford.	Manufacturer.	**25.00**	26.06†	4.0	2.37	28.31	45	15	12	8
4712	Fine Ground Bone.	L. B. Darling Fertilizer Co., Pawtucket, R. I.	Treat & Clark, Orange.	**33.00**	34.30	3.7	2.06	27.99	70	18	12	--
4923	The Rogers & Hubbard Co.'s Strictly Pure Fine Bone.	The Rogers & Hubbard Co., Middletown.	Manufacturer.	**30.00**	30.65†	2.1	3.98	22.67	45	23	24	8
4612	Fine Ground Bone.	Bradley Fertilizer Co., Boston., Mass.	L. F. Judson, Stratford.	32.00	30.06	.2	3.77	19.24	59	29	12	--
			A. M. Clark, Scotland.	**30.00**	----	----	----	----	--	--	--	--
						Valuation equals cost.						
4902	The Rogers & Hubbard Co.'s Raw Knuckle Bone Meal.	The Rogers & Hubbard Co., Middletown.	Manufacturer.	**37.00**	36.99	----	3.75	26.35	60	27	13	--

* From stock bought by the Tobacco Experiment Co.

† See note on page 30.

BONE MANURES SAMPLED BY STATION AGENT.—*Continued.*

Station No.	Name or Brand.	Manufacturer.	Dealer.	Dealer's Cash Price per Ton.	Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Chemical Analysis.		Mechanical Analysis.			
									Finer than			Coarser than $\frac{1}{12}$ inch.
						Cost exceeds Valuation.	Nitrogen.	Phos. Acid.	$\frac{1}{50}$ inch.	$\frac{1}{25}$ inch.	$\frac{1}{12}$ inch.	
4774	The Rogers & Hubbard Co.'s Raw Knuckle Bone Flour.	The Rogers & Hubbard Co., Middletown.	S. E. Frisbie, Milford.	**$40.00**	$38.99	2.5	4.04	25.46	71	29	--	--
			J.P.Barstow & Co., Norwich.	39.00	----	----	----	----	--	--	--	--
4535	Swift Sure Bone Meal.	M. L. Shoemaker & Co., Philadelphia, Pa.	F. Ellsworth, Hartford.	**40.00**	38.47	4.0	5.60	23.19	53	30	17	--
4773	The Rogers & Hubbard Co.'s Strictly Pure Fine Bone.	The Rogers & Hubbard Co., Middletown.	Strong & Tanner, Winsted.	32.00	28.52†	5.1	4.18	21.21	28	34	32	6
			J.P.Barstow & Co., Norwich.	33.00	----	----	----	----	--	--	--	--
				30.00								
4897	Pure Ground Bone.	Crocker Fertilizer and Chemical Co., Buffalo, N. Y.	W. W. Sheldon, So. Woodstock.	**36.00**	34.14	5.4	4.09	24.29	45	33	22	--
4614	Pure Ground Bone.	Rogers Mfg. Co., Rockfall.	Manufacturer.	**30.00**	28.29	6.0	4.34	20.39	25	36	36	3
4781	White Oak Pure Ground Bone.	Clark's Cove Fertilizer Co., Boston, Mass.	John Dolbeare, Poquetanuck.	**31.00**	29.09	6.6	2.60	22.86	56	24	17	3
4882	Self-Recommending Fertilizer.	Frederick Nuhn, Waterbury.	Apothecaries Hall Co., Waterbury.	**32.00**	29.03†	10.2	3.66	24.18	47	15	12	26
4769	Bone Meal.	Williams & Clark Fertilizer Co., New York City.	D. B. Wilson, Waterbury.	**34.00**	30.68	10.8	3.18	23.14	49	29	22	--
4771	Pure Ground Bone.	Downs & Griffin, Birmingham.	F. L. Hallock & Co., Birmingham.	**35.00**	30.32	15.4	4.02	22.99	38	27	27	8
4903	Fine Ground Bone.	Standard Fertilizer Co., Boston, Mass.	J. W. Howe & Son, South Glastonbury.	**35.00**	29.56	18.4	3.90	19.87	49	27	24	--
4710	Pure Ground Bone.	Peck Bros., Northfield.	D. B. Wilson, Waterbury.	30.00	22.69	23.4	4.28	21.07	8	23	41	28
			Strong & Tanner, Winsted.	30.00	----	----	----	----	--	--	--	--
				28.00								
4891	Fine Ground Bone.	Pacific Guano Co., Boston, Mass.	Carlos Bradley & Son, Ellington.	**35.00**	24.28	44.1	2.28	18.17	59	24	17	--
4896	Extra Fine Ground Bone.	Cumberland Bone Phosphate Co., Boston, Mass.	Elliott Bros., Clinton.	**36.00**	20.91	72.1	2.16	15.67	55	21	24	--

† See note on page 30.

3. *Sampled by Consumers.*

4647. Bone Meal. Made by the Danbury Fertilizer Co., Danbury. Sampled and sent by S. D. Woodruff & Sons, Orange. The manufacturer protested that this sample was from old stock which had been in Messrs. Woodruff & Sons' possession since the previous year and did not therefore represent their output of 1895.

4537. Bone Meal. Made by L. F. Frisbee & Co., Hartford. Sampled and sent by S. M. Wells, Wethersfield.

4532. Pure Ground Bone, made by the Rogers Manufacturing Co., Rockfall. Sampled and sent by S. A. Smith, Clintonville.

4737. Finely Ground Steamed Bone, sold by Geo. F. Taylor & Brush, New York City. Sampled and sent by H. C. C. Miles, Milford.

4541. Ground Bone, sold by G. F. Taylor & Brush. Sampled and sent by A. E. Plant, Branford.

4627. Fine Bone, bought of a New York broker by J. Norris Barnes, Yalesville.

MECHANICAL ANALYSES.

	4889	**4647**	**4537**	**4532**	**4737**	**4541**	**4627**
Fine, smaller than $\frac{1}{50}$ inch	62	44	52	65	70	82	79
Fine medium, smaller than $\frac{1}{25}$ inch	19	33	16	18	23	12	19
Medium, smaller than $\frac{1}{12}$ inch	11	23	11	12	6	5	2
Coarse, larger than $\frac{1}{12}$ inch	8	0	21	5	1	1	0
	100	100	100	100	100	100	100

CHEMICAL ANALYSES.

	4889	4647	4537	4532	4737	4541	4627
Nitrogen	2.74	3.94	3.54	2.83	2.82	3.00	2.06
Phosphoric acid	15.16	21.07	25.56	27.21	26.99	26.29	30.22
Cost per ton	$----	29.00	25.00	28.00†	24.00	----	25.60*
Valuation per ton	$22.21	30.56	31.21	34.54	36.01	36.74	38.18

TANKAGE.

This name is applied to the sediment remaining in tanks where meat scrap and bone are cooked with water to separate the fat. After boiling or steaming, the fat rises to the surface and is removed, the soup is run off, and the settlings at the bottom are dried and sold as tankage. As the analyses show, "tankage" has no definite or constant composition. In general it contains more nitrogen and less phosphoric acid than bone.

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* Car lot in Yalesville.

† Several ton lot.

Sampled by Station Agent.

4770. Armour's Special. Made by Armour Packing Co., Kansas City. From stock of F. C. Vibert, Hockanum.

4772. Bone Fertilizer, made by Plumb & Winton, Bridgeport. From stock of H. P. Folley, Danbury.

4547. Pulverized Tankage. Sold by L. Sanderson, New Haven.

4776. Blood, Bone and Meat. Sold by L. Sanderson, New Haven. From stock of Clifton Peck, Lebanon.

Sampled by Private Individuals.

4510. Tankage. Sold by National Fertilizer Co., Bridgeport. Sampled and sent by S. E. Curtis, Stratford.

4531. Tankage. Made by Plumb & Winton, Bridgeport. Sampled and sent by Dennis Fenn, Milford.

4761. Tankage. Sold by Read Fertilizer Co., New York City. Sampled and sent by Milo D. Beach, Litchfield.

4921. Tallow Scrap. Made by J. Maloney, East Haven. Sampled and sent by N. A. Haight, Fair Haven.

MECHANICAL ANALYSES.

	4770	4772	4547	4776	4510	4531	4761	4921
Fine, smaller than $\frac{1}{50}$ inch	65	57	60	64	52	65	61	52
Fine medium, smaller than $\frac{1}{25}$ inch	25	29	31	25	27	24	20	27
Medium, smaller than $\frac{1}{12}$ inch	10	14	9	11	15	11	14	14
Coarse, larger than $\frac{1}{12}$ inch	0	0	0	0	6	0	5	7
	100	100	100	100	100	100	100	100

CHEMICAL ANALYSES.

	4770	4772	4547	4776	4510	4531	4761	4921
Nitrogen	6.96	4.98	5.10	6.01	8.87	5.41	6.62	7.17
Phosphoric acid	11.62	18.61	18.49	14.88	7.29	14.40	15.30	9.61
Cost per ton	$37.00	30.00	35.00	33.00	28.00	30.00	24.20*	30.00
Valuation per ton	$32.50	32.79	33.61	32.79	33.12	30.54	33.63	28.98

DRY GROUND FISH.

This residue from the extraction of fish oil is often sprinkled with diluted oil of vitriol to hinder decay during drying, and the fish bones are as a result softened and to some extent dissolved.

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* Wholesale at Litchfield.

4514. Made by G. W. Miles, Agent, Milford. Sampled by L. & S. T. Merwin, Milford.

4760. Made by G. W. Miles, Agent. Sampled from stock of Olds & Whipple, Hartford.

4878. Sold by the Quinnipiac Co., Boston. Stock of Edmund Halliday, Suffield.

4548. Sold by L. Sanderson, New Haven, to the Station.

4671. Sold by L. Sanderson, to the Conn. Tobacco Experiment Co.

4639. Made by Leander Wilcox, Mystic. Sampled from stock of Lawrence Dailey, East Windsor Hill.

ANALYSES.

	4514	**4760**	**4878**	**4548**	**4671**	**4639**
Nitrogen as ammonia	.80	1.28	.46	.16	----	.16
Organic nitrogen	6.83	5.84	7.30	9.35	----	8.83
Total nitrogen	7.63	7.12	7.76	9.51	9.26	8.99
Water-soluble phosphoric acid	.88	.51	.64	.51	----	.74
Citrate-soluble (reverted) phosphoric acid	5.35	6.56	4.31	5.70	----	5.98
Insoluble phosphoric acid	1.82	.48	3.07	1.08	----	1.17
Total phosphoric acid	8.05	7.55	8.02	7.29	7.36	7.89
Cost per ton	$30.00	38.00	35.00	35.00	35.00	34.00
Valuation per ton	$33.17	32.03	32.53	38.75	----	37.67

MIXED FERTILIZERS.

Here are included all those fertilizers which have been compounded of two or more fertilizer chemicals or animal matters to make a mixture which usually contains the three fertilizer ingredients, nitrogen, phosphoric acid and potash.

BONE AND POTASH.

(See also certain mixtures of bone and potash with other chemicals referred to on page 49.)

4607. Bone and Potash, Square Brand. Made by the Bowker Fertilizer Co., Boston. Stock of Geo. Punzelt, Darien, and J. A. Paine, Danielsonville.

4606. Extra Fine Bone with Potash, Circle Brand. Made by Bradley Fertilizer Co., Boston. Stock of Raymond Bros., So. Norwalk.

4713. A. I. Fertilizer. Made by C. Buckingham, Southport. Stock of N. H. Sherwood, Southport.

C. Buckingham protested that this analysis of his A. I. Fertilizer was lower than the average of the goods, which were guaranteed to contain 4 per cent. of nitrogen, 10 of phosphoric acid and 6 of potash. A second sample, No. **4859,** was therefore drawn from stock in Mr. Buckingham's possession.

4859. A. I. Fertilizer. Made by C. Buckingham, Southport. Sampled from stock of manufacturer.

4605. Ground Bone and Potash, made by the E. Frank Coe Co., New York City. Sampled from stock of E. S. Banks, Southport.

4865. Nameless Fertilizer made by the Danbury Fertilizer Co., Danbury. Sampled by Station agent from stock at the factory.

MECHANICAL ANALYSES.

	4607	**4606**	**4713**	**4859**	**4605**	**4865**
Fine, smaller than $\frac{1}{50}$ inch	68	60	72	68	57	76
Fine medium, smaller than $\frac{1}{25}$ inch	18	26	10	22	18	20
Medium, smaller than $\frac{1}{12}$ inch	13	14	7	8	14	3
Coarse, larger than $\frac{1}{12}$ inch	1	0	11	2	11	1
	100	100	100	100	100	100

CHEMICAL ANALYSES.

Nitrogen	1.94	2.53	2.82	3.30	2.13	4.06
Phosphoric acid	14.62	18.65	13.59	15.07	16.66	9.26
Potash, as Muriate	2.45	1.98	.60	3.21	2.27	4.76
Potash, as Sulphate	----	----	5.56	1.95	----	----
Potash, Total	2.45	1.98	6.16	5.16	2.27	4.76
Cost per ton	$32.00	33.00	35.00	35.00	26.00	30.00
Valuation per ton	$22.48	27.50	27.56	29.90	23.18	26.00

The two following samples, though sold under the name "Bone and Potash," contain only a quarter of one per cent. of nitrogen and therefore their brand is misleading:

4873. Soluble Bone and Potash, made by the Great Eastern Fertilizer Co., Rutland, Vt. Sampled from stock of E. T. Bates, Darien, and Silas Finch, Greenwich.

4714. Animal Bone and Potash, made by Lister's Agricultural Chemical Works, Newark, N. J. Sampled from stock of A. N. Clark, Milford.

ANALYSES.

	4873	4714
Water-soluble phosphoric acid	5.36	6.72
Citrate-soluble (reverted) phosphoric acid	4.51	2.05
Insoluble phosphoric acid	1.81	.38
Total phosphoric acid	11.68	9.15
Potash, as muriate	2.01	5.28
Cost per ton	$25.00	26.00
Valuation per ton	13.92	15.22

II. NITROGENOUS SUPERPHOSPHATES AND GUANOS.

Here are included those mixed fertilizers containing nitrogen, phosphoric acid and in most cases potash, which are not designed by their manufacturers for use on any special crop. "Special Manures" are noticed further on.

1. *Samples drawn by Station Agents.*

In the tables on pages 40 to 47 are tabulated the analyses of seventy-seven brands, made on samples collected by the Station agents.

ANALYSES REQUIRING SPECIAL NOTICE.

The Eastern Farm Supply Association, Montclair, N. J., protested that analysis **4693,** Long Island Special, and **4694,** Cartaret Market Garden Manure, did not represent the average quality of these brands.

A re-test confirmed the accuracy of the Station analysis. It was not possible to get another sample of L. I. Special, but a second sample of the Market Garden Manure was analyzed and is **4906** in the table of analyses, page 40.

The Clark's Cove Fertilizer Co. protested that analysis **4743** was below their guarantee on all three ingredients. "We are positive that we have not sent goods of this grade into the market." A re-test confirmed the accuracy of our analysis. A second sample was, however drawn and analyzed, **4910,** and is given in the table, page 40. The second sample proved to be of much better quality.

The National Fertilizer Co. of Bridgeport requested another analysis of their Fish and Potash, **4849,** as the quantity of nitrogen in that sample was much lower than they expected the goods to contain.

A second analysis, **4915**, was made, see page 42, which showed .4 per cent. more nitrogen, 1.6 more phosphoric acid and 1.4 per cent. less potash.

GUARANTEES.

Of the seventy-six analyses of nitrogenous superphosphates, in the table given on pages 40 to 47, twenty-one are below the maker's minimum guarantee in respect of one ingredient, five in respect of two and one in respect of all three ingredients. Thus more than one-third of the whole number do not fulfill in all respects the maker's claim for them.

It is urged that an excess of one ingredient over the guarantee should be held to make good the deficiency of another. But with reasonable care and skill in the manufacture and in the sampling and analysis of the goods, the actual analysis should not fall below the minimum guaranteed in any respect, particularly when wide limits are allowed in the guarantees themselves.

COST AND VALUATION.

Cost.

The method used to ascertain the retail cost price of the superphosphates is as follows:

The sampling agents inquire and note the price at the time each sample is drawn. The analysis, when done, is reported to each dealer from whom a sample was taken, with an enclosed postal card addressed to the Station, and a request to note on it whether the retail cash price is correctly given and to mail to the Station.

From the data thus obtained the average prices are computed.

Valuation.

The valuation has been computed in all cases in the usual manner as explained on page 16.

Percentage difference given in the table shows the percentage excess of the cost price over the average retail cost of the nitrogen, phosphoric acid and potash contained in the fertilizer.

This information enables the purchaser to estimate the relative value of the different brands and the relative economy of buying mixed fertilizers, or of procuring and compounding the materials needful for a fertilizer.

Which plan is preferable can only be determined by each individual farmer, who should know best what his soil and crops need and what his facilities for purchase and payment are.

In case a fertilizer has sold at two or more different prices, the *manufacturer's price*, when known, has been used in calculating percentage difference.

Otherwise an *average, or nearly average price* forms the basis of comparison between cost and valuation. The price thus employed is printed in heavy-faced type.

The average cost of the nitrogenous superphosphates is $32.32. The average valuation is $23.37, and the percentage difference 38.2.

Last year the corresponding figures were :

Average cost $32.96, average valuation $23.30, percentage difference 41.3.

These valuations, it must be remembered, are based on the assumption that the nitrogen, phosphoric acid and potash in each fertilizer are readily available to farm crops. Chemical examination can show pretty conclusively whether this is true in respect of potash. There is less certainty regarding phosphoric acid, while chemical examination, as it is usually made, gives little or no clue as to the availability of the organic nitrogen of mixed goods. This Station has been for some years engaged in a study of methods for determining approximately the relative availability of nitrogen, and on subsequent pages is given a report of the work done during the past year on this point.

While various inferior or agriculturally worthless forms of nitrogen are in the market, the main security of purchasers of mixed fertilizers is in dealing with firms which have an established reputation and in avoiding "cheap" goods offered by irresponsible parties.

NITROGENOUS SUPERPHOSPHATES AND GUANOS, SAMPLED BY THE STATION.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Dealer's Cash Price per Ton.
4745	Potato and General Crop Fertilizer.	Chas. E. Lyman, Middlefield.	Manufacturer.	**$26.00***
4906	Market Garden Manure.	Eastern Farm Supply Association, Montclair, N. J.	Paul Thompson, West Hartford.	**32.00**
4744	Bone, Fish and Potash.	E. R. Kelsey, Branford.	Samuel A. Chalker, Saybrook.	**25.00**
4785	Unexcelled Phosphate.	Geo. W. Miller, Middlefield.	Manufacturer.	**30.00**
4800	Old Reliable Superphosphate.	L. Sanderson, New Haven.	C. O. Jelliff & Co., Southport.	**30.00**
4756	Pure Fine Bone, Dissolved in Sulphuric Acid.	Mapes' Formula & Peruvian Guano Co., N. Y. City.	Mapes' Branch, Hartford.	**32.00**
4693	Carteret L. I. Special.	Eastern Farm Supply Association, Montclair, N. J.	N. H. Sherwood, Southport.	32.00 **34.00**
4749	Formula "A."	L. Sanderson, New Haven.	C. O. Jelliff & Co., Southport. Clifton Peck, Lebanon. Ira W. Beers, Hamden. J. Pierpont, North Haven.	**35.00** 36.00 35.00 35.00
4797	Ammoniated Dissolved Bone.	Williams & Clark Fertilizer Co., N. Y. City.	T. C. Greene, Torrington.	**26.00**
4750	Quinnipiac Market Garden Phosphate.	Quinnipiac Co., Boston, Mass.	A. P. Wakeman, Fairfield.	**36.00**
4829	IXL Ammoniated Bone Superphosphate.	Geo. W. Miles, Milford.	Manufacturer.	**26.00**
4725	Vegetable Bone Superphosphate.	Crocker Fertilizer & Chemical Co., Buffalo, N. Y.	Meeker Coal Co., Norwalk.	**38.00**
4679	Market Garden Phosphate.	Bowker Fertilizer Co., Boston, Mass.	E. B. Clark & Sons, Milford. Geo. Punzelt, Darien.	**36.00** 36.00
4716	Animal Fertilizer.	L. B. Darling Fertilizer Co., Pawtucket, R. I.	W. W. Cooper, Suffield. F. S. Bidwell, Windsor Locks.	36.00 **35.00**
4806	High Grade Fish and Potash.	Leander Wilcox, Mystic.	Browning & Gallup, New London.	**32.00**
4696	Complete Manure for Light Soils.	Mapes' F. & P. G. Co., N. Y. City.	Mapes' Branch, Hartford. Geo. K. Nason, Willimantic. Birdsey & Foster, Meriden. Dean & Horton, Stamford.	**42.00** 44.00 43.00 43.00
4658	Complete Manure, A Brand.	Mapes' F. & P. G. Co., N. Y. City.	Birdsey & Foster, Meriden. F. S. Bidwell, Windsor Locks. Quinnebaug Store, Danielsonville,	36.00 36.00 36.00 **35.00**
4759	Special Phosphate.	Olds & Whipple, Hartford.	Manufacturer.	**35.00**
4717	Animal Fertilizer, "G" Brand.	L. B. Darling Fertilizer Co., Pawtucket, R. I.	F. S. Bidwell, Windsor Locks. Treat & Clark, Orange.	33.00 29.00 **31.00**
4910	Great Planet "A."	Clark's Cove Fertilizer Co., Boston, Mass.	H. A. Rogers & Co., New London.	**38.00**
4694	Cartaret Market Garden Manure.	Eastern Farm Supply Association, Montclair, N. J.	N. H. Sherwood, Southport.	**32.00**
4653	Complete Manure for General Use.	Mapes' F. & P. G. Co., N. Y. City.	Geo. K. Nason, Willimantic. Birdsey & Foster, Meriden. F. S. Bidwell, Windsor Locks. Dean & Horton, Stamford.	40.00 **39.00** 40.00 39.00

* The full-face figure is the one used in calculating the percentage difference.

ANALYSES.

Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Nitrogen.					Phosphoric Acid.							Potash.		
		Nitrogen as Nitrates.	Nitrogen as Ammonia.	Nitrogen, Organic.	Total Nitrogen.		Soluble.	Reverted.	Insoluble.	Total.		Available.		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.	As Muriate.	Total.	
$28.38	†8.3	----	----	2.47	2.47	*2.5*	3.66	5.70	1.23	10.59	----	9.36	*10.0*	10.09	10.09	*10.0*
*30.56	4.7	----	2.70	1.48	4.18	*3.3*	3.15	4.86	.82	8.83	*8.0*	8.01	*7.0*	1.03	6.08	*7.0*
23.32	7.2	----	.64	3.06	3.70	*3.3*	2.43	2.43	.23	5.09	*4.0*	4.86	----	.60	5.01	*4.0*
27.95	7.3	----	----	2.16	2.16	*1.5*	4.27	6.58	1.39	12.24	*11.5*	10.85	----	8.79	8.79	*8.0*
26.79	11.9	.13	----	2.39	2.52	*1.7*	4.75	5.29	1.65	11.69	*10.0*	10.04	*7.0*	3.13	3.13	*2.0*
27.64	15.7	----	----	2.40	2.40	*2.1*	6.48	10.72	.38	17.58	----	17.20	*12.0*	----	----	----
*28.91	17.6	----	----	3.26	3.26	*3.5*	4.80	4.50	.61	9.91	*8.5*	9.30	*7.5*	8.00	8.00	*8.0*
29.50	18.6	.50	.59	2.93	4.02	*3.3*	3.01	5.27	2.36	10.64	*10.0*	8.28	*6.0*	6.44	6.44	*6.0*
21.84	19.0	----	----	2.08	2.08	*1.7*	4.56	6.22	2.06	12.84	*9.0*	10.78	*8.0*	2.06	2.06	*2.0*
30.03	19.9	.59	1.30	1.75	3.64	*3.3*	5.20	4.06	1.61	10.87	*9.0*	9.26	*8.0*	4.47	6.66	*7.0*
21.59	20.4	----	.94	2.04	2.98	*2.1*	4.88	1.94	2.61	9.43	*9.0*	6.82	*8.0*	2.61	2.61	*2.0*
31.19	21.8	1.05	----	4.33	5.38	*5.0*	4.96	1.70	.27	6.93	*6.0*	6.66	*5.0*	6.47	6.47	*6.0*
29.22	23.2	1.23	----	1.61	2.84	*2.5*	6.24	3.10	2.98	12.32	*8.0*	9.34	*8.0*	9.03	9.03	*10.0*
28.31	23.6	.30	.15	2.85	3.30	*3.0*	2.51	8.33	2.43	13.27	*10.0*	10.84	*6.0*	4.78	4.78	*4.0*
25.66	24.7	----	.41	3.81	4.22	*3.3*	2.83	3.84	.31	6.98	*6 0*	6.67	*5.0*	4.25	4.25	*4.0*
33.65	24.8	1.51	1.24	2.42	5.17	*4.9*	5 07	3.54	.40	9.01	*8.0*	8.61	*6.0*	7.12	7.12	*6.0*
27.28	28.2	.45	.22	2.28	2.95	*2.5*	6.16	6 41	.61	13.18	*12.0*	12.57	*10.0*	3.24	3.24	*2.5*
27.18	28.7	----	.07	3.06	3.13	*3.0*	6.68	5.27	1.58	13.53	*10.0*	11.95	*9.0*	.40	2.31	*2.0*
23.92	29.5	----	.14	2.51	2.65	*1.7*	1.41	7.79	1.88	10.08	*7.0*	9.20	----	4.57	4.57	*4.0*
*29.33	29.6	1.32	----	2.52	3.84	*3.3*	5.04	3.53	2.22	10.79	*9.0*	8.57	*8.0*	6.92	6.92	*7.0*
*24.47	30.7	----	.60	1.84	2.44	*3.0*	3.95	6.11	1.01	11.07	*8.0*	10.06	*7.0*	4.80	4.80	*7.0*
29.42	32.5	.91	.58	2.25	3.74	*3.3*	5.18	6.01	.64	11.83	*10.0*	8.92	*8.0*	4.47	4.47	*4.0*

* See note, p. 37.

† Valuation exceeds cost.

NITROGENOUS SUPERPHOSPHATES AND GUANOS, SAMPLED BY THE STATION.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Dealer's Cash Price per Ton.
4827	Harvest Home.	H. J. Baker & Bro., N. Y. City.	S. J. Hall, Meriden.	**$27.00**
4533	Swift Sure Superphosphate.	M. L. Shoemaker & Co., Philadelphia, Pa.	F. Ellsworth, Hartford.	**38.00**
4813	Standard Complete.	Standard Fertilizer Co., Boston, Mass.	I. H. Bushnell, Jewett City.	**39.00**
4791	High Grade General Fertilizer.	Pacific Guano Co., Boston, Mass.	S. R. Jones, Deep River.	**40.00**
4807	Ammoniated Bone PhosPhate.	Leander Wilcox, Mystic.	Browning & Gallup, New London.	34.00
			Mandy Gray, Poquetanuck.	32.00
				33.00
4821	Fish and Potash, Triangle "A" Brand.	Bradley Fertilizer Co., Boston, Mass.	S. A. Billings, Meriden.	**30.00**
4805	Complete Bone Superphosphate.	Leander Wilcox, Mystic.	Browning & Gallup, New London.	**31.00**
4618	Complete Fertilizer.	Rogers Mfg. Co., Rockfall.	Manufacturer.	**35.00**
4636	A. A. Ammoniated Superphosphate.	H. J. Baker & Bro., N. Y. City.	E. White, Rockfall.	40.00
			C. O. Jelliff & Co., Southport.	34.00
				35.00
4864	Ammoniated Bone Superphosphate.	Preston Fertilizer Co., Greenpoint, L. I.	S. D. Keeler, Ridgefield.	**34.00**
4802	Fish, Bone and Potash.	Read Fertilizer Co., N. Y. City.	W. Tillinghast, Plainfield.	**30.00**
			Fred. R. Tryon, Middletown.	28.00
			N. S. Lee, Old Lyme.	32.00
4915	Chittenden's Fish and Potash	National Fertilizer Co., Bridgeport.	Manufacturer.	**32.00**
4721	Standard Phosphate.	Lister's Agricultural Chemical Works, Newark, N. J.	Geo. W. Dennison, Saybrook.	33.00
			A. N. Clark, Milford.	**32.00**
4652	Ammoniated Dissolved Bone or Farm and Garden Phosphate.	Bowker Fertilizer Co., Boston, Mass.	E. B. Clark & Sons, Milford.	28.00
			J. A. Lewis, Willimantic.	37.00
			Hubbell & Bradley.	32.00
				30.00
4743	Great Planet "A."	Clark's Cove Fertilizer Co., Boston, Mass.	John Dolbeare, Poquetanuck	**38.00**
4722	Quinnipiac Phosphate.	Quinnipiac Co., Boston, Mass.	F. S. Bidwell, Windsor Locks	**35.00**
			Meeker Coal Co., Norwalk.	36.00
			G. G. Tillinghast, Vernon.	33.00
			A. P, Wakeman, Fairfield.	34.00
4699	Success Fertilizer.	Lister's Agricultural Chemical Works, Newark, N. J.	J. A. Foster, Stafford.	31.00
			E. F. Hutchinson, Andover.	30.00
			A. N. Clark, Milford.	26.00
				28.00
4789	Americus Brand Ammoniated Bone Superphosphate.	Williams & Clark Fertilizer Co., N. Y. City.	T. C. Greene, Torrington.	34.00
			Bulkley & Hanmer, Wethersfield.	**35.00**
			D. B. Wilson, Waterbury.	35.00
			Hale, Day & Co., So. Manchester.	36.00
			W. B. Martin, Rockville.	34.00
			John Bransfield, Portland.	35.00

ANALYSES.— *Continued.*

Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Nitrogen.					Phosphoric Acid.							Potash.		
		Nitrogen as Nitrates.	Nitrogen as Ammonia.	Nitrogen, Organic.	Total Nitrogen.		Soluble.	Reverted.	Insoluble.	Total.		Available.		Found.		Guaranteed.
					Found.	Guaran-teed.				Found.	Guaran-teed.	Found.	Guaran-teed.	As Muriate.	Total.	
$20.33	32.8	----	.61	1.17	1.78	*1.0*	5.20	4.94	1.11	11.25	*8.0*	10.14	----	2.34	2.34	*2.0*
28.51	33.2	.70	----	2.26	2.96	----	6.86	4.26	3.66	14.78	----	11.12	----	-----	4.35	----
29.05	34.2	1.30	----	2.42	3.72	*3.3*	4.80	4.34	1.48	10.62	*9.0*	9.14	*8.0*	6.71	6.71	*7.0*
29.56	35.3	.69	.61	2.42	3.72	*3.3*	4.45	4.80	1.36	10.61	*9.0*	9.25	*8.0*	6.76	6.76	*7.0*
24.32	35.6	.22	.27	2.76	3.25	*2.5*	4.56	2.93	.38	7.87	*7.0*	7.49	*6.0*	5.23	5.23	*5.0*
22.08	35.8	----	.14	2.17	2.31	*2.0*	6.08	3.33	1.48	10.89	*6.0*	9.41	*4.0*	3.16	3.16	*4.0*
22.80	35.9	.26	----	2.30	2.56	*2.0*	6.29	3.31	.70	10.30	*9.0*	9.60	*8.0*	3.29	3.29	*3.0*
25.57	36.8	.98	----	1.69	2.67	*2.2*	5.07	5.95	1.07	12.09	*10.0*	11.02	----	.47	3.87	*5.0*
25.08	39.5	.48	1.08	1.14	2.70	*2.5*	8.62	2.63	.65	11.90	----	11.25	*10.0*	2.66	2.66	*2.0*
24.01	41.6	----	.26	1.90	2.16	*2.5*	4.99	3.81	1.11	9.91	*9.0*	8.80	----	1.43	6.07	*2.0*
21.15	41.8	.10	----	2.73	2.83	*2.5*	3.55	1.66	.35	5.56	*6.0*	5.21	*4.0*	6.23	6.23	*4.0*
†22.55	41.9	----	----	2.62	2.62	*2.9*	2.72	5.89	1.73	10.34	*8.0*	8.61	----	3.86	3.86	*4.0*
22.43	42.6	----	.30	2.12	2.42	*1.9*	7.50	2.35	2.30	12.15	*12.0*	9.85	*10.0*	2.01	2.01	*1.5*
20.94	43.2	.35	----	1.53	1.88	*1.5*	6.24	3.92	2.11	12.27	*10.0*	10.16	*8.0*	1.75	2.34	*2.0*
*26.49	43.4	1.26	----	1.98	3.24	*3.3*	5.97	1.93	.63	8.53	*9.0*	7.90	*8.0*	3.61	6.85	*7.0*
24.29	44.0	.54	----	2.26	2.80	*2.5*	6.59	4.36	1.40	12.35	*10.0*	10.95	*9.0*	2.15	2.15	*2.0*
19.41	44.2	----	.22	1.40	1.62	*1.2*	7.49	2.02	2.13	11.64	----	9.51	*9.5*	2.13	2.13	*2.0*
24.22	44.5	.40	----	2.43	2.83	*2.5*	7.04	3.73	1.38	12.15	*10.0*	10.77	*9.0*	2.11	2.11	*2.0*

* See note, p. 37.

† See page 38.

NITROGENOUS SUPERPHOSPHATES AND GUANOS, SAMPLED BY THE STATION.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Dealer's Cash Price per Ton.
4631	Farmer's New Method Fertilizer.	Bradley Fertilizer Co., Boston, Mass.	Wilson & Burr, Middletown.	**$32.00**
			J. A. Lewis, Willimantic.	33.00
			Quinnebaug Store.	34.00
			G. W. Carver, Putnam.	31.00
4678	Hill and Drill Phosphate.	Bowker Fertilizer Co., Boston, Mass.	Crawford & Devine, Uncasville.	38.00
			W. B. Martin, Rockville.	**36.00**
			J. A. Paine, Danielsonville.	36.00
4871	Concentrated Phosphate.	Cumberland Bone Phosphate Co, Boston, Mass.	John Parker, Poquonock.	**40.00**
4740	Bay State Fertilizer, "G" Brand.	Clark's Cove Fertilizer Co., Boston, Mass.	H. H. Davenport, Pomfret.	30.00
			J. M. Burke, South Manchester.	34.00
				32.00
4632	Bradley's Patent Superphosphate.	Bradley Fertilizer Co., Boston, Mass.	J. A. Lewis, Willimantic.	**35.00**
			H. H. Davenport, Pomfret.	34.00
			Quinnebaug Store, Danielsonville.	36.00
			G. W. Carver & Son, Putnam.	34.00
			Raymond Bros., South Norwalk.	35.00
			W. B. Martin, Rockville.	35.00
			R. A. Parker, Warehouse Pt.	35.00
			F. S. Bidwell, Windsor Locks	35.00
			W. W. Cooper, Suffield.	36.00
4847	Chittenden's Ammoniated Bone Phosphate.	National Fertilizer Co., Bridgeport.	Manchester Elevator Co., Manchester.	33.00
			T. H. Eldridge, Norwich.	34.00
			G. A. & H. G. Williams, E. Hartford.	31.00
			Andrew Ure, New Haven.	30.00
				32.00
4651	High Grade Ammoniated Bone Superphosphate.	The E. Frank Coe Co., N. Y. City.	Hillhouse & Taylor, Willimantic.	35.00
			W. F. Palmer, Scotland.	34.00
			E. S. Banks, Southport.	31.00
				32.00
4834	Bay State Fertilizer.	Clark's Cove Fertilizer Co, Boston, Mass.	White & Juno, Rockville.	**36.00**
4846	Fish and Potash, Crossed Fishes Brand.	Quinnipiac Co., Boston, Mass	F. S. Bidwell, Windsor Locks	**36.00**
4842	Ammoniated Bone Superphosphate.	Crocker Fertilizer & Chemical Co., Buffalo, N. Y.	J. P. Little, Columbia.	**35.00**
4747	Alkaline Bone.	E. Frank Coe Co., N. Y. City.	J. O. Fox & Co., Putnam.	**30.00**
4786	Fish and Potash.	Pacific Guano Co., Boston, Mass.	Edmund Halladay, Suffield.	**32.00**
4794	Soluble Pacific Guano.	Pacific Guano Co., Boston, Mass.	Saxton & Strong, Bristol.	36.00
			John Bransfield, Portland.	**35.00**
			R. F. Woodford, Plainville.	35.00
			P. F. Walsh, Montville.	34.00
			T. B. Wickwire, Berlin.	38.00
4754	High Grade Triumph.	Niagara Fertilizer Works, Buffalo, N. Y.	Wm. H. Loomis, Bolton.	33.00
			Wm. Higgins, New London.	**32.00**

ANALYSES.—*Continued.*

Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Nitrogen.					Phosphoric Acid.							Potash.		
		Nitrogen as Nitrates.	Nitrogen as Ammonia.	Nitrogen, Organic.	Total Nitrogen.		Soluble.	Reverted.	Insoluble.	Total.		Available.		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.	As Muriate.	Total.	
$22.09	44.8	.09	....	2.22	2.31	*1.7*	6.58	2.87	1.03	10.48	*10.0*	9.45	*8.0*	3.36	3.36	*3.0*
24.79	45.2	.60	....	2.04	2.64	*2.5*	7.81	4.04	1.28	13.13	*10.0*	11.85	*9.0*	2.16	2.16	*2.0*
27.51	45.4	1.33	....	2.21	3.54	*4.0*	4.72	3.95	1.68	10.35	*10.0*	8.67	*8.0*	6.18	6.18	*7.0*
21.76	47.0	....	.13	2.25	2.38	*1.9*	7.30	2.23	.88	10.41	*10.0*	9 53	*6.5*	2.54	2.54	*2.0*
23.73	47.4	.44	....	2.31	2.75	*2.3*	7.44	2.95	.98	11.37	*11.0*	10.39	*9.0*	2.47	2.47	*1.5*
21.65	47.8	....	.22	2.10	2.32	*2.0*	1.70	8.90	.67	11.27	*9.0*	10.60	....	2.02	2.02	*2.0*
21.61	48.0	....	....	2 10	2.10	*2.0*	7.95	2.18	1.90	12.03	*9.0*	10.13	*9.0*	.18	1.91	*1.9*
23.96	50.2	.63	....	2.18	2.81	*2.5*	8.40	1.87	.86	11.13	*10.0*	10.27	*9.0*	.49	2.36	*2.0*
23.93	50.4	.43	.19	2.56	3.18	*3.3*	3.79	3.32	1.81	8.92	*5.0*	7.11	*3.0*	5.08	5.08	*4.0*
23.19	50.9	....	....	2.92	2.92	*2.9*	7.84	2.76	.34	10.94	*11.0*	10.60	*10.0*	1.07	1.07	*1.0*
19.74	51.9	....	....	1.50	1.50	*1.0*	6.80	2.79	2.49	12.08	*9.0*	9.59	*7.0*	.49	2.51	*3.0*
20.94	52.8	....	....	2.38	2.38	*2.5*	2.30	4.92	1.93	9.15	....	7.22	*6.0*	4.61	4.61	*4.0*
22.90	52.8	.26	....	2.36	2.62	*2.3*	6.51	3.80	1.41	11.72	*10.5*	10.31	*8.5*	1.98	1.98	*2.0*
20.67	54.8	....	....	2.58	2.58	*2.5*	5.68	2.48	1.24	9.40	*9.0*	8.16	*8.0*	2.34	2.34	*2.2*

NITROGENOUS SUPERPHOSPHATES AND GUANOS, SAMPLED BY THE STATION.

Station No.	Name or Brand.	Manufacturer.	Dealer.	Dealer's Cash Price per Ton.
4825	Cleveland Superphosphate.	Cleveland Dryer Co., Boston, Mass.	Chas. E. Scranton, Madison.	**$33.00**
4809	Standard Fertilizer.	Standard Fertilizer Co., Boston, Mass.	Arnold Warner, So. Coventry.	**34.00**
4742	King Philip Alkaline Guano.	Clark's Cove Fertilizer Co., Boston, Mass.	John Dolbeare, Poquetanuck	27.00
			H. H. Davenport, Pomfret.	**28.00**
			J. M. Burke, So. Manchester.	29.00
4812	Standard Superphosphate.	Standard Fertilizer Co., Boston, Mass.	W. E. Truesdell & Co., Burnside.	**40.00**
4720	Ammoniated Dissolved Bone Phosphate.	Lister's Agricultural Chemical Works, Newark, N. J.	J. A. Foster, Stafford.	**32.00**
4687	Smoky City.	Walker, Stratman & Co., Pittsburgh, Pa.	E. White, Rockville.	**32.00**
4739	Fish and Potash, "D" Brand.	Joseph Church & Co., Tiverton, R. I.	W. W. Cooper, Suffield.	32.00
			J. P. Barstow & Co., Norwich	30.00
				31.00
4656	B. D. Sea Fowl Guano.	Bradley Fertilizer Co., Boston, Mass.	R. A. Parker, Warehouse Point.	**35.00**
			F. S. Bidwell, Windsor Locks	33.00
			W. W. Cooper, Suffield.	36.00
4684	New Rival Superphosphate.	Crocker Fertilizer & Chemical Co., Buffalo, N. Y.	W. C. Latimer, So. Coventry	34.00
			Henry Davis, Durham Center.	27.00
				31.00
4787	Royal Bone Phosphate.	Williams & Clark Fertilizer Co., N. Y. City.	Hale, Day & Co., So. Manchester.	33.00
				28.00
4793	Nobsque Guano.	Pacific Guano Co., Boston, Mass.	S. R. Jones, Deep River.	32.00
			T. B. Wickwire, Berlin.	29.00
			P. F. Walsh, Montville.	**30.00**
4634	Sure Crop Phosphate.	Bowker Fertilizer Co., Boston, Mass.	W. Tillinghast, Plainfield.	**30.00**
			F. S. Bidwell, Windsor Locks	28.00
			Hubbell & Bradley, Saugatuck.	30.00
4849	Chittenden's Fish and Potash	National Fertilizer Co., Bridgeport.	T. H. Eldridge, Norwich.	34.00
			N. C. Barker & Co., Lebanon.	**32.00**
4798	Standard Phosphate.	Read Fertilizer Co., N. Y. City.	W. Tillinghast, Plainfield.	**30.00**
			N. S. Lee, Old Lyme.	32.00
			Fred. R. Tryon, Middletown.	28.00
4843	Farmer's Reliable.	Chicopee Guano Co., N. Y. City.	Patrick Ahern, East Windsor Hill.	**35.00**
4815	Cumberl'd Superphosphate.	Cumberland Bone Phosphate Co., Boston, Mass.	Elliott Bros., Clinton.	**38.00**
4840	Fish and Potash.	Williams & Clark Fertilizer Co., N. Y. City.	L. J. Grant, Wapping.	**33.00**
4796	Economical Bone Fertilizer.	Wilkinson & Co, N. Y. City.	Wales Peck, Peck Hill, Woodbridge.	**32.00**
4822	Practical Superphosphate.	Crocker Fertilizer & Chemical Co., Buffalo, N. Y.	W. W. Sheldon, So. Woodstock.	**30.00**
4804	Standard Guano.	Standard Fertilizer Co., Boston, Mass.	Arnold Warner, So. Coventry.	**34.00**
4686	Four Fold Fertilizer.	Walker, Stratman & Co., Pittsburgh, Pa.	E. White, Rockville.	32.00
				30.00
4816	Cumberland Fertilizer.	Cumberland Bone Phosphate Co., Boston, Mass.	Elliott Bros., Clinton.	**38.00**
4824	Cereal Brand.	F. L. Ludlam, N. Y. City.	J. L. Appeley, Canterbury.	†----

† Asked but not given.

ANALYSES.—*Continued.*

Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Nitrogen.					Phosphoric Acid.							Potash.		
		Nitrogen as Nitrates.	Nitrogen as Ammonia.	Nitrogen, Organic.	Total Nitrogen.		Soluble.	Reverted.	Insoluble.	Total.		Available.		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.	As Muriate.	Total.	
$21.19	55.7	----	.18	2.28	2.46	*2.1*	4.59	4.29	2.17	11.05	----	9.88	*9.0*	2.11	2.11	*2.0*
21.72	56.5	----	----	2.48	2.48	*2.0*	7.30	2.03	.71	10.04	*10.0*	9.33	*8.0*	2.52	2.52	*2.0*
17.69	58.2	----	----	1.38	1.38	*1.0*	6.19	2.84	1.14	10.17	*9.0*	9.03	*8.0*	2.35	2.35	*2.0*
25.18	58.8	1.20	----	2.10	3.30	*2.5*	8.00	2.27	.57	10.84	*11.0*	10.27	*9.0*	1.56	2.43	*2.0*
20.14	58.8	----	.30	1.60	1.90	*1.7*	6.66	2.87	2.56	12.09	----	9.53	*9.0*	1.75	1.75	*2.0*
20.10	59.2	----	----	1.36	1.36	*1.2*	10.48	2.32	.33	13.13	*15.0*	12.80	*12.0*	.26	.37	*1.0*
19.44	59.4	----	.18	2.40	2.58	*2.1*	3.60	3.53	1.26	8.39	*7.5*	7.13	*6.0*	2.39	2.39	*2.0*
21.80	60.5	.39	----	1.84	2.23	*2.1*	5.15	5.55	1.86	12.56	*10.0*	10.70	*8.0*	1.70	1.70	*1.5*
18.80	64.8	----	----	1.42	1.42	*1.2*	6.77	3.67	1.25	11.69	*11.0*	10.44	*10.0*	1.61	1.61	*1.6*
16.89	65.7	----	----	1.16	1.16	*1.0*	5.12	4.26	1.21	10.59	*8.0*	9.38	*7.0*	1.94	1.94	*2.0*
17.96	67.0	----	----	1.37	1.37	*1.2*	2.03	7.51	1.74	11.28	*9.0*	9.54	----	2.27	2.27	*2.0*
17.87	67.8	.22	----	.90	1.12	*.8*	4.41	5.97	3.36	13.74	*10.0*	10.38	*8.0*	1.16	1.16	*1.0*
*19.05	67.9	----	----	2.20	2.20	*2.9*	1.58	3.11	4.03	8.72	*6.0*	4.69	----	4.34	5.25	*4.0*
17.62	70.2	----	----	1.08	1.08	*.8*	6.69	1.92	.46	9.07	*10.0*	8.61	*8.0*	4.16	4.16	*4.0*
20.21	73.1	----	----	2.10	2.10	*1.7*	6.24	2.97	2.59	11.80	*9.0*	9.21	*8.0*	1.64	1.64	*2.0*
21.27	78.6	.15	----	2.15	2.30	----	7.01	2.32	1.06	10.39	*10.0*	9.33	*8.0*	2.60	2.60	*2.0*
18.46	78.7	----	.22	2.05	2.27	*2.5*	2.99	2.86	2.27	8.12	*6.0*	5.85	*4.0*	1.81	3.33	*4.0*
17.87	79.0	----	----	1.36	1.36	*1.2*	4.86	3.59	2.50	10.95	*7.0*	8.45	*7.0*	2.89	2.89	*3.0*
16.38	83.1	----	----	1.02	1.02	*.8*	4.48	4.67	3.20	12.35	*8.0*	9.15	*8.0*	1.34	1.34	*1.0*
17.05	99.4	----	----	1.20	1.20	*1.0*	6.03	2.90	1.13	10.06	*10.0*	8.93	*8.0*	2.45	2.45	*2.0*
14.06	113.3	----	----	1.11	1.11	*.8*	5.81	1.50	1.02	8.33	*11.0*	7.31	*8.0*	1.52	1.52	*1.0*
17.60	115.9	----	....	1.08	1.08	*1.0*	4.73	5.20	1.84	11.77	*10.0*	9.93	*8.0*	2.11	2.11	*2.0*
18.78	-----	.20	----	.97	1.17	*.8*	5.84	5.00	3.16	14.00	*10.0*	10.84	*8.0*	1.34	1.34	*1.0*

* See note, p. 37.

2. *Sampled by the Manufacturer.*

In the following table are four analyses made on samples deposited with the Director of the Station by manufacturers in compliance with the requirements of the Fertilizer Law.

The brands named were not found in the Connecticut market by our sampling agents. They are the following:

4884. Anchor Brand Fish and Potash, made by Bradley Fertilizer Co., Boston.

4888. Original Coe's Superphosphate, made by Bradley Fertilizer Co., Boston.

4887. Great Eastern General Fertilizer, made by Great Eastern Fertilizer Co., Rutland, Vt.

4845. Cecrops Fertilizer, Cecrops or Dragon's Tooth Brand, made by Frederic Ludlam, N. Y.

3. *Sampled by Consumers.*

In the following table are three analyses made on samples of this kind. The Station is not responsible for the accuracy of the sampling, though in each case it holds the written statement of the sampler that the Station's directions for sampling were followed.

The three following are of goods made by the Cumberland Bone Phosphate Co., Boston, Mass., and were drawn by D. C. Spencer, Saybrook.

4689, Concentrated Phosphate; **4691,** Cumberland Superphosphate, and **4692,** Cumberland Fertilizer.

	4884	**4888**	**4887**	**4845**	**4689**	**4691**	**4692**
Nitrogen of nitrates	----	.15	----	1.39	1.53	.10	----
Organic nitrogen	3.66	2.35	1.26	1.17	2.02	2.23	1.30
Total nitrogen	3.66	2.50	1.26	2.56	3.55	2.33	1.30
Soluble phosphoric acid	3.31	7.44	6.89	5.12	5.42	6.75	5.09
Reverted phosphoric acid	3.00	2.61	3.20	4.44	4.75	2.72	3.98
Insoluble phosphoric acid	1.74	1.31	1.96	2.06	1.25	1.05	1.20
Total phosphoric acid	8.05	11.36	12.05	11.62	11.42	10.52	10.27
Potash as muriate	3.47	2.44	4.44	7.21	6.64	2.37	2.06
Potash as sulphate	.21	----	----	----	----	----	----
Total potash	3.68	2.44	4.44	7.21	6.64	2.37	2.06
Cost per ton	----	----	----	----	$38.00	32.00	28.00
Valuation per ton	$23.39	22.73	20.73	26.36	29.47	21.30	17.11

III. SPECIAL MANURES.

For Analyses and Valuations see pages 52 *to* 60.

Here are included such mixed fertilizers, chiefly nitrogenous superphosphates, as are claimed by their manufacturers to be specially adapted to the needs of particular crops.

1. *Samples drawn by Station Agents.*

In the tables on pages 52 to 59, are tabulated the analyses of seventy-eight brands made on samples drawn by the Station agents.

ANALYSES WHICH REQUIRE SPECIAL NOTICE.

4746. Lyman's Corn Manure is designed for use with stable manure and as supplementary to it.

Nos. **4879, 4881, 4901, 4609, 4880, 4608,** are mixtures of chemicals and ground bone and apparently contain no other forms of phosphate.

4608 consists of a mixture of ground bone and potash salts alone, and would be classed with other samples of bone and potash (see page 35) were it not branded as a fertilizer for particular crops.

The manufacturers of **4695,** Cartaret Potato Manure, protested that this analysis did not fairly represent the quality of the brand and asked that another sample be drawn from a different lot of the fertilizer. A re-test proved the correctness of the analysis. The analysis of a second sample, drawn in compliance with the manufacturer's request, No. **4905,** appears on page 52. This latter analysis contains somewhat less nitrogen than the former, and more than twice as much potash.

L. Wilcox protested that the analysis **4808,** his Potato, Onion and Tobacco Manure, did not fairly represent the average quality of this brand, which contained over 6 per cent. of potash. A re-test proved the correctness of our analysis. The Station endeavored to find other lots of this brand in market from which to draw samples, but was unable to do so.

The Bradley Fertilizer Co. protested that the per cent. of nitrogen found in analysis **4659,** Complete Manure for Potatoes and Vegetables, was below what the goods on the average contained, and requested a re-test. A re-test proved the correctness of our analysis. The Station agents drew three other samples on which analysis **4998**, page 54, was made, which showed about .3 per cent. more nitrogen, and a per cent. less of phosphoric acid.

The Bradley Fertilizer Co. also protested that analysis **4837**, High Grade Tobacco Manure, showed less nitrogen than the goods were calculated to contain. A re-test confirmed the analysis, but the Station agents were not able to find other samples on which another analysis could be made.

The Niagara Fertilizer Works protested that the analysis of **4752**, Potato, Hop and Tobacco Fertilizer, misrepresented the quality of the goods, which contained over three times the quantity of nitrogen reported (.54 per cent.). A re-test of the sample proved the correctness of our analysis. Nitrogen was therefore determined in three other samples drawn from as many different stocks. The percentages of nitrogen found (.48, .56 and .47) were essentially the same as found in the first analysis.

M. E. Wheeler & Co. protested that analysis No. **4874**, Grain and Oats Fertilizer, totally misrepresented the average quality of the brand and led them to think that our sampling agent drew something which was not their goods. Re-test confirmed the accuracy of our analysis. The sampling agents were unable to find other samples of this brand in market, but an analysis was made of the sample deposited by the manufacturer earlier in the season, with the results given on page 60, No. **4914**. This latter analysis is much higher both in phosphoric acid and potash than the former.

GUARANTEES.

Of the seventy-eight brands of special manures here tabulated nineteen are below the manufacturers' guarantee in respect of one ingredient and ten in respect of two ingredients, so that in all, considerably more than one-third of the whole number do not in all respects fulfill the manufacturers' claims.

COST, VALUATION AND PERCENTAGE DIFFERENCE.

Rejecting from calculation the last three analyses in the tables, the average cost of 75 Special Manures was $37.33 per ton. The average valuation was $27.94. The difference, $9.39, is equivalent to a "percentage difference"* of 33.6.

Last year the corresponding figures were, average cost $38.13, average valuation 28.62, percentage difference 33.2.

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* See page 38.

As will be seen by reference to page 6, Messrs. Mason, Chapin & Co., of Providence, R. I., have entered six brands of fertilizers for sale in this State. Our sampling agents were able to find only three of them, of which the analyses are given on pages 58 and 59. As the manufacturers failed to deposit sealed samples at the Station, it has not been possible to make analyses of the other three brands.

2. *Sampled by Manufacturers, and* 3. *Sampled by Consumers.*

Analyses on page 60.

2. *Sampled by Manufacturers.*

These samples were sent to the Station in compliance with the terms of the Fertilizer Law, and were analyzed because no samples of the brands named were found in market by our sampling agents.

4886. Special Conn. Tobacco Manure, made by the Crocker Fertilizer Co., Buffalo. The manufacturer protests that the per cent. of nitrogen found is lower than the goods on the average contain. Re-test proved the correctness of our analysis.

4883. Garden and Lawn Fertilizer, made by L. B. Darling Fertilizer Co., Pawtucket.

4885. Lister's Special Tobacco Fertilizer, made by Lister's Agricultural Chemical Works, Newark, N. J.

4914. Grass and Oats Fertilizer, made by M. E. Wheeler & Co., Rutland, Vt.

3. *Sampled by Consumers.*

The Station is not responsible for the accuracy of samples of this kind, though it holds the written statement of the sampler that the sampling was done according to the Station's directions.

4690. Cumberland Potato Manure, made by Cumberland Bone Phosphate Co., Boston. Sampled and sent by D. C. Spencer, Saybrook.

4610, Fairchild's Formula for Corn and General Crops. **4611,** The Rogers & Hubbard Co.'s Fertilizer for Oats and Top Dressing. **4619,** Soluble Tobacco Manure, and **4620,** Soluble Potato Manure, all made by the Rogers & Hubbard Co., Middletown. Sampled and sent by F. H. Lockwood, New Canaan.

SPECIAL MANURES, SAMPLED BY THE STATION.

Station No.	Name or Brand.	Manufacturer	Dealer.	Dealer's Cash Price per Ton.
4746	Corn Manure.	Chas. E. Lyman, Middlefield	Manufacturer.	**$21.00**
4616	High Grade Fertilizer for Oats and Top-Dressing.	Rogers Mfg. Co., Rockfall.	Manufacturer.	**42.00**
4879	Fairchild's Formula for Corn and General Crops.	Rogers & Hubbard Co., Middletown.	S. E. Frisbie, Milford. J. P. Barstow & Co., Norwich.	**46.00** 48.00
4866	Rogers & Hubbard Co's Soluble Tobacco Manure.	Rogers & Hubbard Co., Middletown.	S. E. Frisbie, Milford.	**42.00**
4881	Seeding Down Manure.	Mapes' F. & P. G. Co., N. Y. City.	Mapes' Branch, Hartford.	**37.50**
4901	Rogers & Hubbard Co's Grass and Grain Fertilizer	Rogers & Hubbard Co., Middletown.	Manufacturer.	**36.50**
4617	Soluble High Grade Potato and General Crop Manure.	Rogers Mfg. Co., Rockfall.	Manufacturer.	**38.00**
4609	High Grade Corn Fertilizer.	Rogers Mfg. Co., Rockfall.	Manufacturer.	**46.00**
4905	Potato Manure.	Eastern Farm Supply Association, Montclair, N. J.	Paul Thompson, West Hartford,	**30.00**
4872	Potato Fertilizer.	Danbury Fertilizer Co., Danbury.	Manufacturer. E. Baker, Greens Farms.	35.00 32.00 **33.50**
4867	Rogers & Hubbard Co's Soluble Potato Manure.	Rogers & Hubbard Co., Middletown.	John Bransfield, Portland. J. P. Barstow, Norwich. S. E. Frisbie, Milford. G. M. Smith & Co., Rocky Hill.	38.00 40.00 38.00 **38.00**
4880	Rogers & Hubbard Co's Fertilizer for Oats and Top-Dressing.	Rogers & Hubbard Co., Middletown.	John Bransfield, Portland. S. E. Frisbie, Milford.	50.00 **50.00**
4635	Complete Potato Manure.	H. J. Baker & Bro., N. Y. City.	C. O. Jelliff & Co., Southport. E. White, Rockville.	**38.00** 40.00
4680	Onion Manure.	H. J. Baker & Bro., N. Y. City.	D. N. Benton, Guilford. C. O. Jelliff & Co., Southport.	40.00 38.00 **39.00**
4715	Potato and Root Crop Manure.	L. B. Darling Fertilizer Co., Pawtucket, R. I.	F. S. Bidwell, Windsor Locks	**38.00**
4828	Special Tobacco Manure.	H. J. Baker & Bro., N. Y. City.	W. F. Andross, East Hartford.	**40.00**
4718	Tobacco Grower.	L. B. Darling Fertilizer Co., Pawtucket, R. I.	F. S. Bidwell, Windsor Locks	**40.00**
4657	Stockbridge Top-Dressing.	Bowker Fertilizer Co., Boston, Mass.	W. B. Martin, Rockville. J. A. Paine, Danielsonville.	**40.00** 40.00
4758	Tobacco Manure, Wrapper Brand.	Mapes' F. & P. G. Co., N. Y. City.	Mapes' Branch, Hartford.	**48.00**
4757	Tobacco Starter.	Mapes' F. & P. G. Co., N. Y. City.	Mapes' Branch, Hartford.	**35.00**
4608	High Grade Fertilizer for Grass and Grain.	Rogers Mfg. Co., Rockfall.	Manufacturer.	**38.00**
4830	Havana Tobacco Fertilizer.	Quinnipiac Co., Boston, Mass.	O. S. Olmstead, Melrose.	**47.50**
4823	Special Tobacco and Potato Manure.	G. B. Alderman, Suffield.	Manufacturer.	**36.00**
4848	Complete Manure for Corn and Grain.	Bradley Fertilizer Co., Boston, Mass.	C. H. Baker, Andover.	**37.00**
4836	Stockbridge Tobacco Manure.	Bowker Fertilizer Co., Boston, Mass.	J. E. Collins, Wapping.	**50.00**

Analyses.

Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Nitrogen.					Phosphoric Acid.							Potash.		
		Nitrogen as Nitrates.	Nitrogen as Ammonia.	Nitrogen, Organic.	Total Nitrogen.		Soluble.	Reverted.	Insoluble.	Total.		Available.		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.	As Muriate.	Total.	
$22.44*	† 6.4	----	----	----	----	----	5.90	6.46	.43	12.79	*12.0*	12.36	*11.0*	8.98	8.98	*10.0*
38.29	9.6	4.07	----	2.23	6.30	*5.5*	3.63	5.58	.47	9.68	*9.0*	9.21	----	8.91	8.91	*7.5*
41.34*	11.2	3.82	----	1.88	5.70	*5.5*	----	----	----	13.13	*12.0*	----	----	12.67	12.67	*12.5*
37.41	12.2	1.33	.14	3.70	5.17	*5.0*	2.05	5.54	3.10	10.69	*10.0*	7.59	----	.68	10.48	*10.0*
33.38*	12.3	.54	----	2.63	3.17	*2.5*	----	----	----	15.82	*18.0*	----	----	11.92	11.92	*10.0*
32.34*	12.8	----	----	----	3.06	*2.5*	----	----	---	16.25	*16.5*	----	----	11.82	11.82	*12.5*
33.67	12.8	1.55	----	2.36	3.91	*3.5*	4.38	5.19	.31	9.88	*9.0*	9.57	----	.79	9.77	*8.8*
40.72*	12.9	3.37	----	1.63	5.00	*5.5*	----	----	----	12.78	*12.0*	----	----	15.42	15.42	*12.5*
26.11*	14.8	----	.24	2.40	2.64	*2.5*	1.12	6.48	1.94	9.54	*7.5*	7.60	*6.5*	1.25	7.84	*6.0*
29.07	15.2	----	----	4.04	4.04	*3.0*	----	5.47	3.18	8.65	*8.0*	5.47	----	8.45	8.45	*7.0*
32.81	15.8	1.46	.16	3.60	5.22	*5.0*	1.87	5.76	2.81	10.44	*10.0*	7.63	*7.0*	.89	6.09	*5.0*
42.90*	16.5	7.44	----	1.53	8.97	*9.0*	----	----	----	8.62	*8.0*	----	----	8.45	8.45	*8.5*
31.95	18.9	.39	1.36	2.25	4.0	*3.3*	5.66	.94	.18	6.78	----	6.60	*5.8*	4.54	10.58	*10.0*
32.67	19.3	.39	1.74	2.33	4.46	*4.9*	4.45	1.76	.25	6.46	----	6.21	*4.5*	5.69	10.33	*9.0*
31.41	20.9	.41	.15	3.08	3.64	*3.0*	2.48	8.80	2.70	13.98	*10.0*	11.28	----	.81	5.56	*7.0*
32.95	21.3	----	2.66	1.80	4.46	*4.3*	4.59	1.30	.46	6.35	----	5.89	*4.0*	.76	9.68	*10.0*
32.79	21.0	----	.26	2.92	3.18	*4.9*	2.08	7.62	2.33	12.03	*10.0*	9.70	----	1.57	10.11	----
32.50	23.0	3.19	----	1.98	5.17	*5.0*	4.32	3.95	1.15	9.42	*6.0*	8.27	*4.0*	7.12	7.12	*6.0*
38.74	23.9	1.56	2.60	2.22	6.38	*6.2*	.27	4.53	1.01	5.81	*4.5*	4.80	----	.73	10.97	*10.5*
28.23	23.9	1.35	.64	1.15	3.14	*2.5*	6.09	6.66	.50	13.25	*12.0*	12.75	----	.67	3.12	*2.5*
30.41*	24.9	----	----	---	3.48	*3.0*	----	----	----	16.72	*17.0*	----	----	10.65	10.65	*12.5*
37.92	25.2	----	2.94	2.72	5.66	*5.8*	.59	3.46	.71	4.76	*6.0*	4.05	*5.0*	1.20	12.80	*10.0*
28.70	25.4	.63	----	2.55	3.18	*2.9*	2.02	4.89	.66	7.57	*6.0*	6.91	----	.26	9.88	*10.0*
29.46	25.5	1.32	----	2.0	3.32	*3.3*	3.79	7.99	2.61	14.39	*13.0*	11.78	*12.0*	5.02	5.02	*3.0*
39.78	25.6	3.16	----	2.92	6.08	*5.8*	1.06	4.92	6.75	12.73	*6.0*	5.98	----	.53	10.82	*10.0*

* See remarks on this analysis, page 49.

† Valuation exceeds cost.

SPECIAL MANURES, SAMPLED BY THE STATION.—*Continued.*

Station No.	Name or Brand.	Manufacturer.	Dealer.	Dealer's Cash Price per Ton.
4681	Grass and Grain Spring Top-Dressing.	Mapes' F. & P. G. Co., N. Y. City.	Geo. K. Nason, Willimantic.	$41.00
			Birdsey & Foster, Meriden.	40.00
			Mapes' Branch, Hartford.	**39.00**
4698	Corn Manure.	Mapes' F. & P. G. Co., N. Y. City.	D. B. Wilson, Waterbury.	41.00
			Geo. K. Nason, Willimantic,	41.00
			Quinnebaug Store, Danielsonville.	40.00
			Dean & Horton, Stamford.	40.00
				39.00
4650	Potato Manure.	Mapes' F. & P. G. Co., N. Y. City.	Geo. K. Nason, Willimantic.	43.00
			Quinnebaug Store, Danielsonville.	42.00
			Dean & Horton, Stamford.	42.00
			John H. Ray, Greenwich.	40.75
			Birdsey & Foster, Meriden.	42.00
			F. S. Bidwell, Windsor Locks	42.00
			Mapes' Branch, Hartford.	**41.00**
4695	Carteret Potato Manure.	Eastern Farm Supply Association, Montclair, N. J.	N. H. Sherwood, Southport.	32.00
				30.00
4808	Potato, Onion and Tobacco Manure.	Leander Wilcox, Mystic.	Browning & Gallup, New London.	36.00
			Mandy Gray, Poquetanuck.	34.00
				35.00
4700	Fruit and Vine Manure.	Mapes' F. & P. G. Co., N. Y. City.	Birdsey & Foster, Meriden.	39.00
			Mapes' Branch, Hartford.	**38.00**
4659	Complete Manure for Potatoes and Vegetables.	Bradley Fertilizer Co., Boston, Mass.	J. A. Lewis, Willimantic.	40.00
			L. F. Judson, Stratford.	**38.00**
4863	Potato Fertilizer.	Preston Fertilizer Co., Greenpoint, L. I.	E. N. Pierce & Co., Plainville.	39.00
			S. D. Keeler, Ridgefield.	**38.00**
4685	Potato, Hop and Tobacco Phosphate.	Crocker Fertilizer Co., Buffalo, N. Y.	Henry Davis, Durham Center.	32.00
			D. N. Benton, Guilford.	34.00
				33.00
4788	High Grade Special for Potatoes and Tobacco.	Williams & Clark Fertilizer Co., N. Y. City.	W. B. Martin, Rockville.	**39.00**
			Hale, Day & Co., So. Manchester.	42.00
			John Bransfield, Portland.	40.00
			S. A. Flight. Highwood.	35.00
4719	Potato Manure, No. 1.	Lister's Agricultural Chemical Works, Newark, N. J.	A. N. Clark, Milford.	**38.00**
4677	Complete Corn Manure.	H. J. Baker & Bro., N. Y. City.	J. C. Lincoln, Berlin.	----
			E. White, Rockville.	**40.00**
4799	Stockbridge Manure for Corn.	Bowker Fertilizer Co., Boston, Mass.	Crawford & Devine, Uncasville.	**40.00**
			D. B. Wilson, Waterbury.	40.00
			Strong & Tanner, Winsted.	38.00
			J. C. Lincoln, Berlin.	40.00
			E. C. Dennis, Stafford.	40.00
			J. A. Paine, Danielsonville.	40.00
			J. A. Lewis, Willimantic.	40.00
4837	High Grade Tobacco Manure.	Bradley Fertilizer Co, Boston, Mass.	Bulkley & Hanmer, Wethersfield.	**50.00**
4998	Bradley's Complete Manure for Potatoes and Vegetables.	Bradley Fertilizer Co., Boston, Mass.	Bulkley & Hanmer, Wethersfield.	39.00
			E. C. Dennis, Stafford.	40.00
			D. N. Clark, Shelton.	**38.00**

ANALYSES.—*Continued.*

Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Nitrogen.					Phosphoric Acid.							Potash.		
		Nitrogen as Nitrates.	Nitrogen as Ammonia.	Nitrogen, Organic.	Total Nitrogen.		Soluble.	Reverted.	Insoluble.	Total.		Available.		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.	As Muriate.	Total.	
$31.02	25.7	1.44	.98	2.52	4.94	*4.1*	3.70	4.19	.49	8.38	*7.0*	7.89	----	6.11	6.11	*5.0*
30.97	25.9	1.37	.40	2.07	3.84	*3.7*	5.86	5.03	.20	11.09	----	10.89	*8.0*	6.57	6.57	*6.0*
32.32	26.8	1.74	.44	1.67	3.85	*3.7*	5.41	4.46	.49	10.36	*8.0*	9.87	*8.0*	.72	8.06	*6.0*
23.48*	27.7	----	.18	2.69	2.87	*2.5*	1.30	7.90	.99	9.19	*7.5*	9.20	*6.5*	3.64	3.64	*6.0*
27.21*	28.6	.66	----	2.96	3.62	*3.3*	5.22	2.70	.65	8.57	*8.0*	7.92	*7.0*	2.00	5.97	*6.0*
29.34	29.5	.33	.26	1.57	2.16	*1.7*	4.08	3.82	.35	8.25	*7.0*	7.90	*5.0*	.60	12.44	*11.0*
29.30*	29.7	1.37	----	2.17	3.54	*3.7*	5.30	4.80	1.41	11.51	*9.0*	10.10	*8.0*	6.48	6.48	*6.0*
29.09	30.6	.72	----	2.54	3.26	*3.3*	4.80	4.73	2.69	12.22	----	9.53	*8.0*	2.80	6.60	*7.0*
25.15	31.2	----	----	2.74	2.74	*2.1*	7.71	2.27	1.69	11.67	*11.0*	9.98	*10.0*	4.09	4.09	*3.3*
29.57	31.8	1.30	.32	1.90	3.52	*3.7*	5.55	4.25	1.24	11.04	*8.0*	9.80	*7.0*	7.09	7.09	*7.0*
28.70	32.4	1.10	.44	2.16	3.70	*3.7*	6.72	1.42	1.01	9.15	----	8.14	*7.5*	7.36	7.36	*7.0*
30.03	33.2	.33	2.44	1.33	4.10	*4.9*	5.39	2.13	.35	7.87	----	7.52	*6.0*	7.41	7.41	*7.0*
29.84	34.0	1.50	----	2.23	3.73	*3.3*	8.21	3.05	.77	12.03	*10.0*	11.26	*8.0*	4.95	4.95	*4.0*
37.30†	34.0	----	2.66	2.88	5.54	*5.8*	1.01	2.63	1.92	5.56	*4.0*	3.64	----	.73	12.57	*10.8*
28.34†	34.1	1.36	----	2.46	3.82	*3.7*	4.66	3.63	2.23	10.52	*9.0*	8.29	*8.0*	6.30	6.30	*6.0*

* See remarks on this analysis, page 49.

† See remarks on this analysis, page 50.

Special Manures, Sampled by the Station.—*Continued.*

Station No.	Name or Brand.	Manufacturer.	Dealer.	Dealer's Cash Price per Ton.
4660	Potato Special.	Crocker Fertilizer Co., Buffalo, N. Y.	Henry Davis, Durham Center.	$36.00
			Meeker Coal Co., Norwalk.	40.00
				38.00
4838	Fine Wrapper Tobacco Grower.	Williams & Clark Fertilizer Co., N. Y. City.	L. J. Grant, Wapping.	**50.00**
4839	Chittenden's Complete Fertilizer.	National Fertilizer Co., Bridgeport.	E. B. Clark & Sons, Milford.	38.00
			A. Y. Beach, Seymour.	40.00
			A. P. Wakeman, Fairfield.	38.00
			Manchester Elevator Co., Manchester.	41.00
				39.00
4795	Quinnipiac Onion Manure.	Quinnipiac Co., Boston, Mass.	F. S. Bidwell, Windsor Locks	**40.00**
4655	Stockbridge Manure for Potatoes and Vegetables.	Bowker Fertilizer Co., Boston, Mass.	W. B. Martin, Rockville.	**40.00**
			J. A. Lewis, Willimantic.	40.00
			W. Tillinghast, Plainfield.	30.00
			J. A. Paine, Danielsonville.	40.00
4724	Wheat and Corn Phosphate.	Crocker Fertilizer Co., Buffalo, N. Y.	Henry Davis, Durham Center.	**30.00**
4817	Potato, Tobacco and Hop.	Pacific Guano Co., Boston, Mass.	Carlos Bradley & Son, Ellington.	**33.00**
4654	Vegetable, Vine and Tobacco Manure.	Great Eastern Fertilizer Co., Rutland, Vermont.	Wm. Burr & Son, Fairfield.	**33.00**
			E. T. Bates, Darien.	36.00
			Silas Finch, Greenwich.	32.00
4534	Swift Sure Potato Fertilizer.	M. L. Shoemaker & Co., Philadelphia, Pa.	F. Ellsworth, Hartford.	**38.00**
4683	High Grade Potato Manure.	E. Frank Coe Co., N. Y. City.	F. L. Hallock & Co., Birmingham.	38.00
			D. N. Benton, Guilford.	34.00
			J. O. Fox & Co., Putnam.	**35.00**
4723	Potato Manure.	Quinnipiac Co., Boston, Mass.	A. P. Wakeman, Fairfield.	34.00
			G. G. Tillinghast, Vernon.	33.00
			Meeker Coal Co., Norwalk.	36.00
			F. S. Bidwell, Windsor Locks	37.00
			F. M. Raymond, Westport.	**35.00**
4820	High Grade Potato Manure.	M. E. Wheeler & Co., Rutland, Vermont.	Wm. M. Owen, No. Haven.	33.00
			P. B. Moffitt, Pomfret.	**34.00**
			C. A. Loomis, Andover.	35.00
4819	Corn Fertilizer.	M. E. Wheeler & Co., Rutland, Vermont.	P. B. Moffitt, Pomfret.	**32.00**
			C. A. Loomis, Andover.	33.00
			Wm. M. Owen, No. Haven.	32.00
4682	Top-Dressing for Grass and Grain.	Bradley Fertilizer Co., Boston, Mass.	Raymond Bros., S. Norwalk.	**37.00**
4826	Cleveland Potato Phosphate.	Cleveland Dryer Co., Boston, Mass.	Chas. E. Scranton, Madison.	**34.00**
4741	Potato and Tobacco Fertilizer.	Clark's Cove Fertilizer Co., Boston, Mass.	John Dolbeare, Poquetanuck	32.00
			J. M. Burke, So. Manchester.	36.00
				34.00
4790	Americus Potato Phosphate.	Williams & Clark Fertilizer Co., N. Y. City.	John Bransfield, Portland.	35.00
			W. B. Martin, Rockville.	34.00
			Geo. Beaumont, Wallingford.	**35.00**
			Hale, Day & Co., So. Manchester.	36.00
			A. M. Clark, Scotland.	32.00
			D. B. Wilson, Waterbury.	36.00
			G. C. Greene, Torrington.	34.00
			S. A. Flight, Highwood.	33.00

ANALYSES.—*Continued.*

Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Nitrogen.					Phosphoric Acid.							Potash.		
					Total Nitrogen.					Total.		Available.		Found.		
		Nitrogen as Nitrates.	Nitrogen as Ammonia.	Nitrogen, Organic.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	As Muriate.	Total.	Guaranteed.
$28.29	34.3	----	----	3.76	3.76	*3.7*	6.74	2.00	1.30	10.04	*9.0*	8.74	*8.0*	5.63	5.63	*5.4*
36.88	35.6	----	3.50	2.34	5.84	*5.8*	2.74	2.19	.93	5.86	----	4.93	*5.0*	.87	9.78	*10.0*
28.63	36.2	----	1.35	2.11	3.46	*3.7*	4.56	5.42	.68	10.66	*10.0*	9.98	*8.0*	5.52	5.52	*6.0*
29.17	37.1	1.30	----	2.44	3.74	*3.3*	5.18	2.85	1.90	9.93	*9.0*	8.03	*8.0*	7.89	7.89	*7.0*
29.07	37.5	1.58	----	1.81	3.39	*2.5*	6.77	3.08	.81	10.66	*8.0*	9.85	*6.0*	7.26	7.26	*5.0*
21.53	39.3	----	----	2.24	2.24	*2.1*	7.58	2.84	1.09	11.51	*11.0*	10.42	*10.0*	1.64	1.64	*1.6*
23.41	40.9	----	----	2.44	2.44	*2.1*	6.40	3.76	1.67	11.83	*9.0*	10.16	*8.0*	3.19	3.19	*3.0*
23.37	41.2	----	----	2.22	2.22	*2.1*	6.60	2.19	.57	9.36	*9.0*	8.79	*8.0*	6.09	6.09	*6.0*
26.75	42.0	.58	----	1.92	2.50	*2.5*	4.59	5.09	5.24	14.92	*11.0*	9.68	*8.0*	6.07	6.07	*6.0*
24.41	43.3	----	.38	1.83	2.21	*1.9*	6.91	2.19	2.25	11.35	*9.0*	9.10	*8.0*	.41	5.16	*6.0*
24.34	43.7	----	.59	2.17	2.76	*2.5*	3.65	4.10	1.78	9.53	*7.0*	7.75	*6.0*	4.51	5.79	*5.0*
23.62	43.9	.10	----	2.30	2.40	*2.1*	6.78	1.93	.58	9.29	*9.0*	8.71	*8.0*	5.82	5.82	*3.8*
22.10	44.7	1.00	----	1.90	2.90	*1.7*	7.07	1.90	.65	9.62	*10.0*	8.97	*8.0*	2.22	2.22	*2.0*
25.07	47.5	4.96	----	----	4.96	*4.9*	1.62	4.36	1.04	7.02	*6.0*	5.98	*5.0*	.59	2.97	*2.5*
22.93	48.2	----	.14	2.18	2.32	*2.1*	6.84	3.22	1.43	11.49	*10.0*	10.06	*8.0*	3.22	3.22	*3.0*
22.84	48.8	----	----	2.28	2.28	*2.1*	6.03	4.12	1.58	11.73	*9.0*	10.15	*8.0*	3.24	3.24	*3.0*
23.43	49.3	.40	.13	2.31	2.84	*2.5*	3.44	3.97	1.55	8.96	*7.0*	7.41	*6.0*	5.57	5.57	*5.0*

SPECIAL MANURES, SAMPLED BY THE STATION.—*Continued.*

Station No.	Name or Brand.	Manufacturer.	Dealer.	Dealer's Cash Price per Ton.
4801	Vegetable, Vine and Fruit Manure.	Read Fertilizer Co., N. Y. City.	R. W. Keeler, Ridgefield.	$36.00
			Wm. M. Bulkley, Fairfield.	33.00
				34.50
4814	Potato Fertilizer.	Cumberland Bone Phosphate Co., Boston, Mass.	W. F. Palmer, Scotland.	**34.00**
4818	General for Grass and Grain.	Great Eastern Fertilizer Co., Rutland, Vermont.	J. A. Foster, Stafford.	**34.00**
4755	Wheat and Corn Producer.	Niagara Fertilizer Co., Buffalo, N. Y.	Wm. H. Loomis, Bolton.	30.00
				29.00
			Wm. Higgins, New London.	28.75
4688	Potato Special, Welcome Brand.	Walker, Stratman & Co., Pittsburgh, Pa.	E. White, Rockville.	**38.00**
4831	Grass Fertilizer.	Quinnipiac Co., Boston, Mass.	O. S. Olmstead, Melrose.	**35.00**
4751	Corn Manure.	Quinnipiac Co., Boston, Mass.	Ansel A. Champion, Black Hall.	**34.00**
4633	Potato Manure.	Bradley Fertilizer Co., Boston, Mass.	W. B. Martin, Rockville.	36.00
			J. A. Lewis, Willimantic.	37.00
			Quinnebaug Store, Danielsonville.	38.00
			G. W. Carver & Son, Putnam	34.00
			Raymond Bros. So. Norwalk	**36.00**
			R. A. Parker, Warehouse Point.	38.00
			L. F. Judson, Stratford.	37.00
4753	Grass and Grain Grower.	Niagara Fertilizer Works, Buffalo, N. Y.	Wm. Higgins, New London.	26.00
			Wm. H. Loomis, Bolton.	28.00
				27.00
4844	Grass Manure.	Williams & Clark Fertilizer Co., N. Y. City.	L. J. Grant, Wapping.	**36.00**
4792	Special Potato Manure.	Pacific Guano Co., Boston, Mass.	S. R. Jones, Deep River.	38.00
			T. B. Wickwire, Berlin.	38.00
			R. F. Woodford, Plainville.	35.00
			P. F. Walsh, Montville.	36.00
				37.00
4832	Bay State Potato Manure.	Clark's Cove Fertilizer Co., Boston, Mass.	White & Juno, Rockville.	**38.00**
4697	Special Potato Fertilizer.	Lister's Agricultural Chemical Works, Newark, N. J.	J. A. Foster, Stafford.	32.00
			E. F. Hutchinson, Andover.	34.00
				33.00
4803	Potato and Tobacco Fertilizer.	Standard Fertilizer Co., Boston, Mass.	Arnold Warner, So. Coventry.	**38.00**
4841	Chicopee A 1, Vegetables and Potatoes.	Chicopee Guano Co., N. Y. City.	Jno. Ahern, Windsor Locks.	**40.00**
4752	Potato, Tobacco and Hop Fertilizer.	Niagara Fertilizer Works, Buffalo, N. Y.	Wm. H. Loomis, Bolton.	33.00
			Wm. Higgins, New London.	**32.00**
4833	Big Bonanza, Tobacco Special.	Walker, Stratman & Co., Pittsburgh, Pa.	J. T. Ball, Unionville.	**36.00**
4874	Grass and Oats Fertilizer.	M. E. Wheeler & Co., Rutland, Vermont.	Wm. M. Owen, No. Haven.	**28.00**
4869	Lawn and Grass.	Mason, Chapin & Co., Providence, R. I.	Cadwell & Jones, Hartford.	**50.00**
4870	"Potato."	Mason, Chapin & Co., Providence, R. I.	Cadwell & Jones, Hartford.	**50.00**
4868	Corn Fertilizer.	Mason, Chapin & Co., Providence, R. I.	Geo. K. Nason, Willimantic.	**50.00**

ANALYSES.—*Continued.*

Valuation per Ton.	Percentage Diff. between Cost and Valuation.	Nitrogen.					Phosphoric Acid.							Potash.		
		Nitrogen as Nitrates.	Nitrogen as Ammonia.	Nitrogen, Organic.	Total Nitrogen.		Soluble.	Reverted.	Insoluble.	Total.		Available.		Found.		Guaranteed.
					Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.	As Muriate.	Total.	
$22.87	50.9	----	----	1.94	1.94	*1.7*	5.34	2.03	.43	7.70	*7.0*	7.37	*6.0*	8.51	8.51	*8.0*
22.52	50.9	----	----	2.16	2.16	*2.0*	6.08	4.23	1.17	11.48	*11.0*	10.31	*9.0*	3.30	3.30	*3.0*
22.49	51.1	----	----	2.93	2.93	*2.9*	7.12	1.89	.42	9.43	*9.0*	9.01	*8.0*	2.26	2.26	*2.0*
19.18	51.1	----	----	1.60	1.60	*1.2*	6.37	2.78	2.10	11.25	*9.0*	9.15	*8.0*	2.62	2.62	*2.2*
25.00	52.0	----	----	2.20	2.20	*1.7*	7.82	2.80	.47	11.09	*13.0*	10.62	*9.0*	----	4.85	*5.0*
22.85	53.1	4.30	----	----	4.30	*3.9*	2.53	2.90	1.09	6.52	*6.0*	5.43	*5.0*	.76	3.24	*2.0*
21.57	57.6	----	.14	2.30	2.44	*2.1*	5.44	3.96	1.82	11.22	*10.0*	9.40	*9.0*	2.04	2.04	*1.5*
22.79	57.9	.51	----	2.24	2.75	*2.5*	4.22	3.06	1.13	8.41	*8.0*	7.28	*6.0*	5.54	5.54	*5.0*
16.83	60.4	----	----	.97	.97	*0.8*	4.75	5.13	2.75	12.63	*8.0*	9.88	*7.0*	1.32	1.32	*1.1*
22.27	61.6	4.12	----	----	4.12	*3.9*	2.62	2.58	1.09	6.29	*6.0*	5.20	*5.0*	.53	3.40	*2.0*
22.55	64.0	.26	.17	2.25	2.68	*2.5*	3.36	3.92	1.89	9.17	*7.0*	7.28	*5.0*	5.12	5.12	*5.0*
23.02	65.0	.26	----	2.41	2.67	*2.5*	4.32	3.89	1.12	9.33	*7.0*	8.21	*6.0*	4.87	4.87	*5.0*
19.83	66.4	----	.24	1.52	1.76	*1.7*	6.19	2.54	2.31	11.04	*8.0*	8.73	----	3.09	3.09	*3.0*
22.17	71.4	----	----	2.30	2.30	*2.3*	7.17	2.29	.80	10.26	*10.0*	9.46	*9.0*	3.49	3.49	*3.0*
23.22	72.2	----	----	2.46	2.46	*2.9*	7.33	1.73	1.20	10.26	*8.0*	9.06	*7.0*	4.35	4.35	*5.0*
17.95*	78.3	----	----	.54	.54	*1.6*	7.52	2.78	1.29	11.59	*9.0*	10.30	*8.0*	3.97	3.97	*2.7*
19.88	81.0	----	----	1.88	1.88	*1.7*	5.24	3.78	2.07	11.09	*15.0*	9.02	*11.0*	2.67	2.67	*2.0*
12.84*	118.0	----	----	----	----	----	4.20	5.16	1.35	11.71	*12.0*	9.36	*10.0*	1.75	1.75	*2.0*
19.62	154.8	4.28	---	----	4.28	*5.4*	.25	2.93	7.12	10.30	*5.0*	3.18	----	.45	.45	*1.0*
17.17	181.3	3.88	----	----	3.88	*3.3*	.43	1.43	9.81	11.67	*10.0*	1.86	----	.13	.13	*1.0*
15.70	218.4	2.50	----	----	2.50	*3.0*	----	1.62	12.45	14.07	*11.0*	1.62	----	1.60	1.60	*2.8*

* See remarks on this analysis, page 50.

ANALYSES.

	4886	4883	4885	4914	4690	4610	4611	4619	4620
Nitrogen as Nitrates	trace	trace	----	----	.19	4.03	7.54	1.27	1.51
as Ammonia	----	----	----	----	----	----	----	.12	.16
Organic	5.26	3.90	2.20	----	2.25	2.09	1.48	3.81	3.49
Total	*5.26*	*3.90*	*2.20*	none	*2.44*	*6.12*	*9.02*	*5.20*	*5.16*
Guaranteed	5.7	----	1.7	none	2.0	5.5	8.8	5.0	5.0
Phosphoric acid, soluble.	5.57	4.22	8.40	4.77	4.88	----	----	1.46	1.82
reverted	1.02	4.59	3.18	5.73	3.96	----	----	8.10	7.60
insoluble	.25	3.98	1.03	2.49	1.16	----	----	.98	.90
Total	*6.84*	*12.79*	*12.61*	*12.99*	*10.00*	*12.52*	*8.69*	*10.54*	*10.32*
Guaranteed	6.0	----	----	12.0	11.0	12.0	7.9	10.0	10.0
Potash as Muriate	.67	1.01	3.84	2.42	4.49	12.49	8.99	.78	1.03
as Sulphate	10.55	3.59	----	----	----	----	----	9.88	5.03
Total	*11.22*	*4.60*	*3.84*	*2.42*	*4.49*	*12.49*	*8.99*	*10.66*	*6.06*
Guaranteed	10.0	----	4.0	2.0	3.0	13.0	8.4	10.0	5.0
Cost per ton	----	----	----	----	$32.00	46.00	50.00	42.00	38.00
Valuation per ton	$36.94	29.25	24.71	15.20	22.72	42.08	43.70	38.94	33.75

MISCELLANEOUS FERTILIZERS AND MANURES.

COTTON HULL ASHES.

In the table on page 61 are given 23 analyses of these ashes.

Samples **4916** and **4917** were drawn from the same car lot, the former from sacks containing ashes of a reddish color, the latter from sacks in which the ashes were light gray.

Allowing 6, 5½ and 2 cents per pound respectively for soluble, reverted, and insoluble phosphoric acid, the price of actual potash in twenty samples of cotton hull ashes has ranged from 4.3 cents to 13 cents per pound, the average being 6.1 cents.

The ashes sold in 1895 have been of better average quality than those sold in the previous year.

"UNLEACHED WOOD ASHES."

In the table page 62 are given 16 analyses of this article. The per cent. of soluble potash ranges from 1.52 per cent. to 7.40, being on the average 4.34 per cent., while the average content of phosphoric acid was 1.55.

These ashes contain on the average between 45 and 50 per cent. of carbonate of lime, and some 14 per cent. of coal, sand and earth.

ANALYSES OF COTTON HULL ASHES.

Station No.	Dealer or Purchaser.	Sampled by	Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Insoluble Phosphoric Acid.	Potash Soluble in Water.	Cost per ton.	Valuation per ton.	Potash costs per pound in cents.
4624	G. A. Douglass, Thompsonville	E. M. Barnes, Thompsonville	2.43	7.40	.48	26.14	$33.75	$38.70	*4.3*
4525	I. L. Spencer, Suffield	F. B. Hathaway, Windsor Locks	3.41	8.98	1.30	28.35	40.00	44.25	*4.5*
4477	Planters Cotton Seed and Crushing Association, Greenville, Tenn	T. Soule & Co., New Milford	.50	5.09	1.11	24.64	30.00	32.51	*4.7*
4916	W. F. Andross, East Hartford	Edmund Halliday, Suffield	1.30	5.52	.60	27.80	36.00	37.06	*5.1*
4588	Olds & Whipple, Hartford	Olin Wheeler, Buckland	1.28	3.24	.57	37.41	45.00	44.61	*5.3*
4526	I. L. Spencer, Suffield	E. S. Seymour, Windsor Locks	2.71	9.39	1.42	24.35	40.00	39.71	*5.3*
4640	Olds & Whipple, Hartford	Station Agent	3.26	7.00	.20	30.61	45.00	43.83	*5.4*
4561	G. A. Douglass, Thompsonville	C. D. Woodworth, Thompsonville	.80	7.82	.53	22.17	33.75	33.05	*5.4*
4734	W. W. Cooper, Suffield	Alfred Griffin, Granby	1.50	8.79	.66	25.40	40.00	38.40	*5.5*
4568	L. Sanderson, New Haven	Chas. H. Wells, Suffield	.91	8.21	.41	27.16	40.00	38.80	*5.5*
4500	W. W. Cooper, Suffield	G. A. Harmon, Suffield	1.42	9.69	.44	24.89	40.00	38.68	*5.5*
4584	Olds & Whipple, Hartford	Wm. S. Pinney, Suffield	.99	10.08	.44	24.44	40.00	38.12	*5.6*
4571	J. C. Eddy, Simsbury	David L. Brockett, Suffield	.77	8.00	.44	26.35	40.00	37.57	*5.7*
4917	W. F. Andross, East Hartford	Edmund Halliday, Suffield	1.33	7.60	.78	21.37	36.00	32.71	*6.0*
4476	F. W. Brode & Co., Memphis, Tenn.	T. Soule & Co., New Milford	.45	5.44	2.17	17.24	30.00	25.49	*6.5*
4572	Edmund Halliday, Suffield	David L. Brockett, Suffield	1.01	6.53	.55	20.12	35.00	29.74	*6.5*
4663	R. A. Parker, Warehouse Point	John E. Thompson, Warehouse Point	2.03	6.53	.59	21.92	40.00	32.88	*6.8*
4615	R. A. Parker, Warehouse Point	Joseph Watson, Enfield	1.97	6.58	1.03	20.37	40.00	31.40	*7.3*
4768	Troknee Mills, Spartanburg, S. C.	E. A. Wildman, New Milford	.74	5.04	.45	17.07	35.00	24.53	*8.3*
5001	Olds & Whipple, Hartford	Olin Wheeler, Buckland	----	4.48	1.11	15 24	45.00	21.37	*13.0*
4539	Southern Mills	Edward Austin, Suffield	.58	9.44	.93	26.92	----	39.72	----
4540	Southern Mills	Edward Austin, Suffield	----	----	----	27.89	----	----	----
4674	Eli Hough, for Tobacco Exp't. Co.	Station Agent	----	----	----	24.11	----	----	----

ANALYSES OF "UNLEACHED WOOD ASHES."

Station No.	Dealer.	Sampled and sent by	Phosphoric Acid.	Potash Soluble in Water.	Lime.	Carbonic Acid.	Sand and Earth.	Coal.	Cost per ton,
4475	Allison & Frost, New York City	J. E. Larmer, Jr., Norwalk	1.80	5.59	33.90	23.07	12.13	2.28	$10.50
4995	Allison & Frost, New York City	L. S. Ellsworth, Simsbury	1.15	5.09	33.20	20.01	6.43	1.50	10.50
4515	Forest City Wood Ash Co., Boston	T. J. Stroud, Shaker Station	1.68	3.95	24.11	14.81	17.33	2.96	10.50
4900	Forest City Wood Ash Co., Boston	Ard Welton, Plymouth	.64	1.52	30.46	19.29	24.62*	----	10.50
4523	A. L. Hartness, Detroit	N. S. Platt, Cheshire	2.28	7.40	30.35	18.15	10.44	1.40	10.00
4465	Monroe, Lalor & Co., Oswego, N. Y.	D. N. Clark, Westville	1.78	4.45	35.12	23.78	8.17	2.11	11.50
4485	Monroe, Lalor & Co., Oswego, N. Y.	J. N. Barnes, Yalesville	1.43	3.40	38.75	21.08	8.89	1.46	11.00
4538	Monroe, Lalor & Co, Oswego, N. Y.	Edward Austin, Suffield	1.84	4.27	42.15	22.86	3.93	1.46	11.00
4626	Monroe, Lalor & Co, Oswego, N. Y.	W. F. Whitney, Yalesville	1.25	4.88	36.45	20.65	7.73	2.52	10.00
4766	Monroe, Lalor & Co., Oswego, N. Y.	T. S. Gold, West Cornwall	1.15	3.40	38.77	22.96	5.03	1.43	11.50
4925	Monroe, Lalor & Co., Oswego, N. Y.	S. D. Woodruff & Sons, Orange	1.41	3.57	36.15	20.65	8.50	1.88	11.00
4999	Monroe, Lalor & Co., Oswego, N. Y.	D. N. Clark, Westville	.70	3.78	36.33	24.21	15.11	1.77	----
5000	Monroe, Lalor & Co., Oswego, N. Y.	D. N. Clark, Westville	1.25	4.07	27.89	19.58	26.88	2.17	----
4590	J. W. Waller, Long Hill	L. N. Mallett, Long Hill	1.71	5.31	30.58	18.16	10.11	1.21	11.00
4644	Seymour Brass Co., Seymour	M. L. Coleman, Ansonia	2.25	4.52	42.38	23.85	4.34	.74	----
4673		Conn. Tobacco Exp't. Co., Poquonock	2.43	4.28	29.25	14.95	26.11	4.32	----

* Includes charcoal.

The same fertilizing ingredients can be bought vastly cheaper in other forms.

One ton of cotton hull ashes, for instance, costing $40.00, will supply as much potash and phosphoric acid as six tons of these wood ashes, costing $63.00. The six tons of wood ashes, however, carry 3,260 pounds of lime in excess of the lime in a ton of cotton hull ashes.

Under some conditions, no doubt, this lime is worth more on the soil than the potash and phosphoric acid themselves, and cannot, perhaps, be purchased to better advantage than in the form of wood ashes. In many other cases the cotton hull ashes contain all the alkali that the soil requires.

HOME MIXTURES.

The fact that cotton seed meal and dissolved phosphate rock sold at very low prices during the last winter and spring, induced many farmers to mix their own fertilizers who had not previously done it.

Fifteen samples of these home mixtures have been analyzed at this Station. In the following tables are given the formulas by which they were compounded and their chemical analyses and valuations. These fertilizers as a rule have a higher percentage of nitrogen and of potash than the average of factory-mixed goods and considerably less phosphoric acid.

The *valuations* are calculated on the same basis as in factory-mixed goods.

The *cost* covers the materials alone *at regular market rates unless otherwise stated*, and does not include cost of mixing. Perhaps from one dollar to one and a half dollars per ton should be allowed for this.

The *mechanical condition* of these home-mixtures has been uniformly good, and not noticeably different from that of factory-mixed goods.

Considerable objection has been made to home-mixing according to such formulas as are given in the table, on the following grounds:

1st. That mixtures made with dissolved rock phosphate would cake or set in the bags, making their application to land difficult.

2d. That the soluble and reverted phosphoric acid of dissolved rock phosphate was not so available to crops as that of dissolved bone black.

3d. That the nitrogen of cotton seed meal was not so available to crops as that of animal matter.

4th. That cotton seed meal would not run through a fertilizer drilling machine.

5th. That no money could be saved by home-mixing.

As has been repeatedly stated in previous reports of this Station, there is no evidence nor any reason to suppose that the soluble and reverted phosphoric acid of dissolved rock is any less available than that of dissolved bone black. It is certain that most factory-mixed goods are made with the former rather than the latter.

Careful experiments indicate that the nitrogen of cotton seed meal is as readily available as the best forms of animal matter, and decidedly more available than that of fish or tankage. When the nitrogen of blood or of tankage costs fifteen cents a pound, and that of cotton seed meal only twelve cents, it is a waste of money to use the former instead of the latter.

The other objections against these formulas may best be met by the statements of those who have had some years' experience in mixing their own fertilizers in this State.

"Mixtures of nitrate of soda, muriate of potash and dissolved rock soon grow hard by standing, but by using, say two hundred pounds or more of dry material, as tankage or bone, I have no trouble. I have used no factory-mixed goods in years, for I save eight to ten dollars per ton over agent's prices by mixing my own."

"The mixture of acid phosphate, nitrate of soda and muriate of potash would not go through the fertilizer attachment of an Aspenwall Potato Planter. It seemed to work right up into a paste by the agitator. With the addition of 400 pounds of cotton seed meal to the ton it went through all right, though not as well as when 400 pounds of dry, rather coarse raw bone were added to the ton, in place of cotton seed meal. Home mixtures have certainly given good satisfaction and it has paid me to make my own mixtures."

"I have never had any trouble on account of caking even if kept over until the next season. This year a mixture containing 600 pounds of (dissolved) South Carolina rock per ton, mixed about May 1st, was in good condition when the last was used, July 10th. I did not use a drill, but cotton seed meal gave no trouble in a hand distributor or 'Eclipse' Corn Planter. I most decidedly think it has paid me to do my own mixing. It is some

FORMULAS AND ANALYSES OF HOME MIXTURES.

Station No.	Made by	Formula, pounds per ton of mixture.								Analyses.								Cost (unmixed) and Valuation.	
		Nitrate of Soda.	Cotton Seed Meal.	Tankage.	Bone.	Dissolved Bone Black.	Dissolved Rock Phosphate.	Sulphate of Potash.	Muriate of Potash.	Nitrogen as Nitrates.	Organic Nitrogen.	Total Nitrogen.	Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Insoluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	Cost per ton.	Valuation per ton.
4527	S. D. Woodruff & Sons, Orange	----	1150	----	----	----	600	----	250	----	4.28	4.28	3.09	3.07	1.12	7.28	7.15	$19.28*	$29.82
4860	S. D. Woodruff & Sons, Orange	----	1150	----	----	----	600	---	250	----	4.08	4 08	3.57	3.54	.48	7.59	6.36	19.28*	27.54
4649	J. H. Webb, Hamden	----	1200	----	----	----	500	----	300	----	4.27	4.27	2.67	2.22	.14	5.03	7.99	22.50	26.98
4850	Clifton Peck, Lebanon	400	----	600	----	1000	----	----	----	2.97	2.03	5.00	9.82	2.42	.83	13.07	.49	33.90	30.85
4851	Dennis Fenn, Milford	200	----	800	400	400	----	----	200	1.31	3.35	4.66	3.82	4.79	3.93	12.54	4.78	34.25	30.70
4852	G. H. Bartlett, North Guilford	200	400	700	----	300	----	----	400	1.59	3.77	5.36	2.70	3.28	1.73	7.71	10.42	30.15	34.13
4853	Andrew Ure, New Haven	----	800	----	----	----	800	----	400	----	2 93	2.93	5.04	3.15	.19	8.38	7.04	22.50	25.61
4854	M. D. Beach, Litchfield	320	260	260	----	----	680	----	480	2.62	1.96	4.58	2.58	3.59	1.07	7.24	10.79	30.19	31.52
4855	J. P. Phelps, Hamden	600	----	----	----	----	1100	----	300	4.64	----	4.64	5.97	1.42	.08	7.47	9.34	29.00	31.08
4856	R. H. Tucker, Saybrook	----	----	600	1080	----	----	----	320	----	4.34	4.34	----	----	----	14.58	8.10	31.10†	28.66
4857	G. F. Platt & Son, Milford	200	----	700	300	700	----	----	100	1.40	3.74	5.14	4.10	4.00	2.26	10.36	2.39	36.25	28.91
4858	G F. Platt & Son, Milford	200	----	700	300	700	----	----	100	1.52	3.28	4.80	2.53	5.60	3.38	11.51	3.45	36.25	29.04
4876	W. H. Olcott, South Manchester	----	1200	----	----	----	500	----	300	----	4.08	4.08	2.16	3.16	.69	6.01	8 18	----	27.17
4877	W. H. Olcott, South Manchester	----	1200	----	----	----	500	500	----	----	4.14	4.14	2.03	3.16	.72	5.91	7.97	----	28.24
4920	J. H. Webb, Hamden	----	----	----	1800	----	----	----	200	----	3.70	3.70	----	----	----	21.73	3.86	34.00	33.39

* Car lot quantities. † Special rates on bone and tankage.

trouble, but the actual cost has never exceeded $1.25 per ton and has averaged less than $1.00."

"I had no trouble from caking of the acid phosphate used. I had no trouble in using the mixture in any way. The cotton seed fertilizer has given me as good satisfaction as any factory-mixed I ever used. It has paid me extremely well to make home-mixtures."

"When used soon after mixing we had no trouble from caking. A small lot after standing two months was somewhat caked. I applied the cotton seed mixture at the same rate per acre as I commonly apply the factory-mixed. The crops seem as good and there was a saving of about $15.00 per ton in favor of home-mixture."

"There was no trouble whatever from caking. We never handled a fertilizer which worked better, all the constituents being fine-ground and smooth. We tested the mixture by the side of two well known high grade brands of fertilizer, and the result showed that the mixture was fully as effective as the factory-mixed goods. The only way in which the factory goods worked better in our trials was that the crops started a little quicker. The home-mixture was a little slow in starting.

We consider this due to the fact that we used no nitrate of soda. This is one of the things we think we have learned by our experience.

We think the home-mixture has paid us as well as any experiment we ever tried. We shall mix all our own fertilizers in the future."

SWAMP MUCK.

4585. From J. P. Newton, Saybrook. Dug in the fall and sample taken from heap which had been exposed through the winter.

4637. "Pond muck." Dried under cover. From Samuel Wilson, Wolcott.

4646. Swamp muck, partially dried. From Miss M. A. Neale, Southington.

4667. Pond muck and aquatic weeds taken from the pond in the fall and let lie over winter in heaps. From Frank B. Ashton, Middletown.

ANALYSES.

As received.

	4585	**4637**	**4646**	**4667**
Water	67.43	4.68	39.90	55.82
Organic matter	18.50	17.40	33.89	12.27
Ash	14.07	77.92	26.21	31.91
	100.00	100.00	100.00	100.00
Sand and soil	12.83	73.20	19.03	25.92
Nitrogen	.44	.60	1.24	.75

Water-free.

Organic matter	56.80	18.27	56.30	27.85
Ash	43.20	81.73	43.70	72.15
	100.00	100.00	100.00	100.00
Sand and soil	39.39	76.86	31.58	58.83
Nitrogen	1.35	.63	2.06	1.70

These samples show the usual variations in quality. From one-third to three-fourths of the weight of the dry material consists of sand and soil, but there is a considerable quantity of nitrogen in three of the samples, probably of some value as a fertilizer though the nitrogen of swamp muck is usually rather inert.

MARINE MUD.

This material is much used as a fertilizer and amendment on shore farms, and is believed in some cases to be equal in value to stable manure, load for load.

Its quality as a fertilizer is found to vary with the locality from which it is taken, and these differences in fertilizing value are not indicated or explained by chemical analysis.

4482. Taken from the surface to depth of one foot.

4484. Taken from 12 to 24 inches below the surface.

4483. Taken from 24 to 36 inches below the surface.

All of the above were taken by C. Q. Eldridge, Old Mystic, from a mud flat in the Mystic River.

4919. Mud deposited by a small river. Sent by D. C. Spencer, Saybrook.

ANALYSES.

As received.

	4482	4484	4483	4919
Water	27.33	37.78	46.14	30.18
Organic matter	3.18	3.42	4.40	7.18
Ash	69.49	58.80	49.46	62.64
	100.00	100.00	100.00	100.00
Sand and soil	67.01	55.42	45.10	55.53
Nitrogen	.08	.11	.13	.25
Phosphoric acid	.05	.04	.05	----

Water-free.

	4482	4484	4483	4919
Organic matter	4.36	5.47	8.36	10.27
Ash	95.64	94.53	91.64	89.73
	100.00	100.00	100.00	100.00
Sand and soil	91.80	88.67	85.69	79.40
Nitrogen	.11	.18	.24	.36
Phosphoric acid	.07	.06	.10	----

BEEF SCRAPS.

4648. A sample of this material was sent by F. J. Hamilton, Thompsonville. It consists of waste gathered from meat markets, steamed or boiled to extract the grease and pressed into large cakes after removing the larger bones. It is used chiefly as a poultry food, but was sent to the Station to determine its fertilizer value.

The sample contained

Moisture	23.17
Nitrogen	7.22
Phosphoric acid	3.78

It contains, even in its damp state, as much nitrogen and more phosphoric acid than cotton seed meal. But owing to its mechanical condition it would be difficult to use it directly as a fertilizer. It should be composted with other material.

ANTHRACITE COAL ASHES.

4524. A sample of the finest part of coal ashes deposited in the ash box and flues of boilers in a large steam-heating plant. Sampled and sent by J. F. Barnard, North Haven.

It contained 83.56 per cent. of matters insoluble in strong acid, 3.16 per cent. of phosphoric acid and .12 per cent. of potash.

While its value as a fertilizer must be very small, it is quite possible that a heavy application of this material might greatly improve a very light, sandy soil.

REVIEW OF THE FERTILIZER MARKET.

FOR THE YEAR ENDING NOVEMBER 1ST, 1895.

BY E. H. JENKINS.

NITROGEN.

Nitric Nitrogen.

The *wholesale* New York quotation of nitrogen in this form was 13.2 cents in November, 1894. It fell steadily to 10.3 cents in April and since then has risen gradually to 11.7 cents in October, 1895.

The average of the monthly quotations (given on page 74) shows that nitrate of soda has ruled lower this year than for some years previously. The figures are as follows:

Year	1895	1894	1893	1892	1891	1890
Average quotation	11.4	13.0	12.7	12.1	12.9	11.5

The *retail* price of nitrogen in nitrate in this State at freight centers has been about 15½ cents per pound.

Ammonic Nitrogen.

The *wholesale* New York quotations of nitrogen in the form of sulphate of ammonia have been very much lower than in 1894, when they were practically prohibitory on its use as a fertilizer. The monthly quotation in November 1894 was 16.4 cents per pound. It fell to 15 cents in January, held that figure till April and has fallen steadily ever since, being quoted in October, 1895, at 12.2.

The average of the year's monthly quotations has been 14.3.

The corresponding averages for the years 1894, 1893, 1892, 1891 and 1890, were respectively 17.3, 15.7, 14.5, 15.6, and 16 cents, so that sulphate of ammonia has ruled lower this year than in any year since 1889.

Sulphate of ammonia has not figured in the Connecticut retail market.

Organic nitrogen.

The *wholesale* New York quotations of nitrogen in the forms of red blood, black or low grade blood and concentrated tankage for each month in the year are shown in the table on page 74. Azotin has not been quoted since February.

It will be seen that nitrogen in all these forms of animal matter has been cheaper than in the years 1893 and 1894, and that both high grade and low grade blood have steadily declined in price since January.

But these forms of organic nitrogen do not often appear in our retail market.

Low grade tankage, fish, bone, and cotton seed meal are the forms most used by those who depend on home-mixing or the use of fertilizer chemicals rather than on factory mixtures.

PHOSPHATIC MATERIALS.

Rough bone and ground bone have been quoted uniformly at $19.50 and $22.75 per ton, wholesale, through the whole year.

Ground Charleston rock has also been quoted at $8.12½ per ton till September and since then at much lower rates.

Sulphuric acid quotations have remained unchanged through the year.

Available phosphoric acid in dissolved rock phosphate has been quoted during the season at prices ranging from 2.62 to 3.5 cents per pound *wholesale*.

Dissolved phosphate rock has during the past year figured somewhat in our retail market, and there will no doubt be a further demand for it the coming season. For analyses and further remarks on the subject, see pages 25 and 64.

POTASH.

Muriate of Potash.

Since January potash in this form has been quoted *at wholesale* from 3.54 to 3.60 cents per pound, half a cent lower than during the last six months of 1894.

The retail price in Connecticut has ranged from 4 to 4½ cents per pound.

The Double Sulphate of Potash and Magnesia.

Since January, 1895, this has been quoted, *at wholesale*, at 4.32 cents per pound, somewhat lower than last year.

It has cost at retail in Connecticut about 5.3 cents per pound.

High Grade Sulphate of Potash.

The *wholesale* New York quotation of potash in this form has been about 4.2 cents for the year, more than half a cent per pound lower than in 1894.

It has retailed in this State at prices ranging from 4.9 to 5.8 cents per pound.

The review of the market quotations indicates in general that nitrogen in all forms has ruled considerably lower this year than last, that potash salts have been somewhat cheaper, and that there has been no great change in the cost of available phosphoric acid.

The market quotations given above are taken from the "Oil, Paint and Drug Reporter," published in New York. The weekly quotations for each month are averaged, and this average is taken as the quotation for the month.

The following explanations will help in the examination of the market quotations, and will also show the basis on which they have been interpreted in this review:

Phosphate rock, *kainit*, *bone*, *fish-scrap*, *tankage* and some other articles are quoted and sold by the ton. The seller usually has an analysis of his stock and purchasers often control this by analysis at the time of purchase.

Sulphate of ammonia, nitrate of soda and muriate of potash are quoted and sold by the pound, and generally their wholesale and retail rates do not differ very widely.

Blood, azotin and ammonite are quoted at so much "per unit of ammonia." To reduce ammonia to nitrogen, multiply the per cent. of ammonia by the decimal .824 (or multiply the percentage of ammonia by 14 and divide that product by 17). A "unit of ammonia" is one per cent., or 20 pounds per ton. To illustrate: if a lot of tankage has 7.0 per cent. of nitrogen, equivalent to 8.5 per cent. of ammonia, it is said to contain 8½ units of ammonia, and if quoted at $2.25 per unit, a ton of it will cost 8½×2.35= $19.13.

The term "ammonia" is *properly* used only in those cases where the nitrogen actually exists in the form of ammonia, but it is a usage of the trade to reckon all nitrogen, in whatever form it occurs, as ammonia.

To facilitate finding the actual cost of nitrogen per pound from the cost per unit of ammonia in the market reports, the following table is given :

Ammonia at	$3.00	per unit is equivalent	to Nitrogen at	18.2	cts. per lb.
"	2.90	"	"	17.6	"
"	2.80	"	"	17.0	"
"	2.70	"	"	16.4	"
"	2.60	"	"	15.8	"
"	2.50	"	"	15.2	"
"	2.40	"	"	14.6	"
"	2.30	"	"	14.0	"
"	2.20	"	"	13.4	"
"	2.10	"	"	12.8	"
"	2.00	"	"	12.2	"
"	1.90	"	"	11.6	"
"	1.80	"	"	11.0	"

Commercial sulphate of ammonia contains on an average 20.5 per cent. of nitrogen, though it varies considerably in quality. With that per cent. of nitrogen (equivalent to 24.3 per cent. of ammonia),

At	4.00	cents per pound,	Nitrogen costs	19.5	cents per lb.
"	3.95	"	"	19.3	"
"	3.90	"	"	19.0	"
"	3.85	"	"	18.8	"
"	3.80	"	"	18.5	"
"	3.75	"	"	18.3	"
"	3.70	"	"	18.0	"
"	3.65	"	"	17.8	"
"	3.60	"	"	17.5	"
"	3.55	"	"	17.3	"
"	3.50	"	"	17.1	"
"	3.45	"	"	16.8	"
"	3.40	"	"	16.6	"

Commercial Nitrate of Soda averages 95 per cent. of pure sodium nitrate or 16.0 per cent. of nitrogen.

If quoted at	3.0	cents per pound,	Nitrogen costs	18.8	cents per lb.
"	2.9	"	"	18.2	"
"	2.8	"	"	17.5	"
"	2.7	"	"	16.9	"
"	2.6	"	"	16.2	"

If quoted at	2.5	cents per pound,	Nitrogen costs	15.6	cents per lb.
"	2.4	"	"	15.0	"
"	2.3	"	"	14.4	"
"	2.2	"	"	13.8	"
"	2.1	"	"	13.2	"
"	2.0	"	"	12.5	"
"	1.9	"	"	11.9	"
"	1.8	"	"	11.3	"
"	1.7	"	"	10.6	"

Commercial Muriate of Potash and also High Grade (98 per cent.) Sulphate of Potash usually contain 50½ per cent. of "actual potash," or potassium oxide.

If quoted at	2.60	cents per lb.,	Potassium Oxide	costs	5.15	cents per lb.
"	2.50	"	"	"	4.95	"
"	2.40	"	"	"	4.75	"
"	2.30	"	"	"	4.55	"
"	2.25	"	"	"	4.45	"
"	2.20	"	"	"	4.35	"
"	2.15	"	"	"	4.25	"
"	2.10	"	"	"	4.15	"
"	2.05	"	"	"	4.06	"
"	2.00	"	"	"	3.96	"
"	1.95	"	"	"	3.86	"
"	1.90	"	"	"	3.76	"
"	1.85	"	"	"	3.66	"
"	1.80	"	"	"	3.56	"
"	1.75	"	"	"	3.46	"
"	1.70	"	"	"	3.36	"

The Double Sulphate of Potash and Magnesia has about 26½ per cent. of potassium oxide.

If quoted at	1.00	cents per lb.,	Potassium	Oxide costs	3.77	cents per lb.
"	1.05	"	"	"	3.96	"
"	1.10	"	"	"	4.15	"
"	1.15	"	"	"	4.34	"
"	1.20	"	"	"	4.53	"
"	1.25	"	"	"	4.72	"
"	1.30	"	"	"	4.90	"

The following table shows the fluctuations in the wholesale prices of a number of fertilizing materials in the New York market, since January, 1891. The price given for each month is the average of the four weekly quotations of that month. Sulphate of ammonia is assumed to contain 20.5 per cent. and nitrate of soda 16.0 per cent. nitrogen, and muriate of potash 50½ per cent. of actual potash or 80 per cent. of pure salt.

WHOLESALE PRICES OF FERTILIZING MATERIALS.

		Cost of Nitrogen at wholesale in						Cost of Potash at wholesale in			Available Phosphoric Acid in Dissolved South Carolina Rock. Cents per pound.
		Dried Blood.									
		Red. Cents per pound.	Black or low grade. Cents per pound.	Azotin or Ammonite. Cents per pound.	Concentrated Tankage. Cents per pound.	Nitrate of Soda. Cents per pound.	Sulphate of Ammonia. Cents per pound.	Muriate of Potash. Cents per pound.	Double Manure Salt. Cents per pound.	High Grade Sulphate of Potash. Cents per pound.	
1891.	November	12.6	12.3	11.5	----	13.5	14.7	3.68	4.53	4.33	3.69
	December	12.4	12.1	11.5	----	13.3	14.7	3.63	4.63	4.41	3.69
1892.	January	12.2	11.5	11.5	----	12.9	14.7	3.62	4.79	4.45	3.69
	February	11.6	11.3	11.5	----	12.0	14.7	3.64	4.77	4.48	3.69
	March	11.5	11.0	11.2	----	12.1	14.7	3.71	4.77	4.48	3.69
	April	11.8	11.3	11.2	----	11.0	14.7	3.78	4.77	4.48	3.69
	May	12.0	11.5	11.2	----	10.5	14.7	3.78	4.77	4.48	3.69
	June	11.7	11.2	11.2	----	10.0	14.7	3.78	4.77	4.48	3.69
	July	12.1	11.7	11.2	----	11.1	14.7	3.78	4.77	4.48	3.69
	August	12.3	12.1	11.2	----	11.7	14.7	3.78	4.77	4.48	3.60
	September	12.4	12.0	12.0	----	12.4	14.2	3.78	4.77	4.48	3.30
	October	13.0	12.6	12.6	----	12.9	14.0	3.78	4.77	4.48	3.30
	November	14.1	13.8	13.7	----	13.7	14.0	3.78	4.77	4.48	3.30
	December	14.6	14.2	14.8	----	13.7	14.0	3.78	4.77	4.48	3.30
1893.	January	16.2	15.8	15.9	12.3	13.8	14 0	3.51	4.25	4.70	3.33
	February	18.5	18.0	17.9	15.7	14.1	14.0	3.56	4.32	4.16	3.09
	March	20.0	19.8	19.6	19.3	14.7	15.6	3.56	4.32	4.16	3.09
	April	18.0	17.7	18.1	19.3	14.6	17.1	3.56	4.32	4.16	3.09
	May	16.2	15.4	16.4	18.3	13.0	17.1	3.56	4.32	4.16	3.09
	June	14.5	14.0	14.8	14.2	11.0	15.9	3.75	4.32	4.16	3.09
	July	13.7	13.1	13.7	14.2	11.1	14.9	3.75	4.32	4.16	3.09
	August	13.5	12.1	13.9	14.2	11.4	15.6	3.75	4.25	4.16	3.09
	September	12.5	12.2	13.2	14.2	11.6	15.9	3.75	4.32	4.16	3.09
	October	16.2	15.3	15.3	17.1	11.9	16.4	3.75	4.32	4.16	3.09
	November	16.6	15.7	16.6	16.3	11.7	16.4	3.74	4.33	4.15	3.09
	December	16.1	15.3	16.1	16.3	11.3	16.4	3.74	4.33	4.15	3.09
1894.	January	15.9	14.7	16.0	15.9	12.0	16 7	3.58	4.30	4.18	3.09
	February	15.9	15.2	15.9	15.4	11.7	18 4	3.71	4.44	4.28	3.09
	March	15.5	14.6	15.5	15.4	13 0	18.5	3.71	4.44	4.28	3.09
	April	14.5	13.9	14.2	13.3	14.0	17.6	3.84	4.54	4.39	2.98
	May	14.5	13.8	14.2	12.2	14.4	16.7	4.13	5.04	4.85	3.00
	June	13.2	12.6	13.1	12.2	14.3	16.7	4.13	5.04	4.85	3.00
	July	12.6	12.6	12.9	12.2	13.8	16.8	4.13	5.04	4.85	3.00
	August	13.3	12.6	13.3	12.3	13.7	17.7	4.13	5.04	4.85	3.09
	September	15.7	14.5	15.4	12.3	13.5	18.3	4.13	5.04	4.85	3.12
	October	15.1	14.4	15.2	12.4	12.9	17.5	4.13	5.04	4.85	3.12
	November	14.1	13.1	14.0	12.3	13.2	16.4	4.13	5.04	4.85	3.00
	December	13.5	12.4	13.1	12.3	12.9	16.0	4.13	5.04	4.85	3.10
1895	January	12.7	12.2	13.0	12.3	12.1	15.0	3.54	4 24	4.13	3.50
	February	11.9	11.2	----	12.3	11.4	15.0	3.54	4.24	4.13	3.37
	March	12.1	10.5	----	12.3	10.4	15.0	3.59	4.32	4.20	3.37
	April	11.7	10.6	----	12.3	10.3	15.0	3.59	4.32	4.20	3.37
	May	12.1	10.8	----	12.3	10.5	14.3	3.59	4.32	4.20	3.37
	June	11.7	10.9	----	12.3	11.0	13.6	3.59	4.32	4.20	3.37
	July	11.6	10.7	----	12.3	10.9	13.4	3.60	4.32	4.20	3.37
	August	11.5	10.2	----	12.3	10.8	13.1	3.60	4.32	4.20	3.37
	September	11.8	10.2	----	12.3	11.3	13.0	3.60	4.32	4.20	3.23
	October	11.8	10.2	----	12.3	11.7	12.2	3.60	4.32	4.20	2.62

ON THE USE OF COMMERCIAL FERTILIZERS FOR FORCING-HOUSE CROPS.

EXPERIMENTS WITH TOMATOES.

By E. H. Jenkins and W. E. Britton.*

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*The general plan of this work, the arrangement of its details and the preparation of this paper, are our joint work. The horticultural work has been done wholly by Mr. Britton. The chemical work involved has been done by Messrs. Winton and Ogden.

The use of commercial fertilizers in forcing houses has apparently received little attention from horticulturists. Bulletins Nos. 10 and 15 of the Massachusetts Hatch Station, Bulletin 43 of the Ohio Station and Bulletins 28 and 32 of the New York Cornell Station, contain the only references to work or observations on this subject, which we have been able to find.

Yet to those who are raising or contemplate raising winter crops under glass, the question of substituting fertilizers for manure, in part at least, is a very important one. Forcing-house soil, as it is usually prepared, consists of rich garden soil or rotted turf, composted with from one-fourth to one-half its bulk of horse manure. Aside from the labor of hauling and of repeatedly working over this material to secure the fine mellow condition which is desired, the cost formerly was not great. But the general introduction of electric cars has cut down enormously the production of horse manure in cities which has been the main dependence of our market gardeners. In consequence, the preparation of suitable soil for forcing-houses is increasingly expensive.

Besides this it is found that even a rich natural soil cannot carry forcing-house tomatoes to their highest productiveness, and therefore liquid manure is often used to water the soil after the plants have come into bearing.

The admirable work on the use of commercial fertilizers on field tomatoes, done at the New Jersey Station, has proved that the ripening of the crop may be very materially hastened by the proper use of fertilizer chemicals, especially of nitrate of soda.

To hasten the ripening of crops under glass, where the expense of growing them is so much greater than in the field, must greatly increase the profits of the business.

These considerations have led us to endeavor to determine with all possible accuracy how much plant food various forcing-house crops take from the soil during their growth, and whether commercial fertilizers can be used instead of stable manure, wholly or in part, to supply this plant food.

A further question also connected with these, is, whether the humus of rotted manure, generally regarded as necessary to regulate the storage and circulation of moisture in the soil under natural conditions, can be replaced by some cheap substitute, or dispensed with altogether in forcing-house culture, where the supply of soil moisture can be well regulated by artificial means.

With the resources at our command, only a beginning could be made with the work, in 1895.

EXPERIMENTS WITH TOMATOES.

Our first endeavor was to find out how much *nitrogen* tomato plants raised under glass take from the soil, in their fruit and vines, and how much nitrogen needs to be in the soil to meet fully this demand of the plants.

These questions we studied by raising tomatoes in plots on the forcing-house benches which were filled with a soil known to be practically free from available nitrogen, but believed to contain all other ingredients necessary for a maximum tomato crop. To these plots were added known quantities of nitrogen in form of nitrate of soda.

The weight of the fruit harvested, and of the vines which bore it, with the chemical analyses of both, furnish the means of determining how much nitrogen, phosphoric acid and potash a crop of tomatoes takes from the soil. Comparison of the quantities of nitrogen applied to the several plots, with the weights of the crops and of their nitrogen, gives some indication of the amount of nitrogen necessary to apply in order to secure a maximum crop.

To fix the initial quantities of fertilizing ingredients to be used, in the absence of all data, was necessarily guess work, and another season's tests, at least, will be needed to fully solve the questions proposed. But the experiments of 1895 have yet done much towards solving them and have furnished, incidentally, valuable results and suggestions.

We give herewith a full description of the method adopted and the course of the experiment, both being necessary to any judgment of its value.

The Forcing House.

The house was newly erected and designed by ourselves. It is a sash-bar structure made for a general-purpose house, being three-quarters span (nearly), sixteen feet wide by forty feet long, running east and west, and a partition across the centre divides the house into two apartments of equal size. The north and south benches run the entire length but the centre bench is shorter to allow for walks at the ends. The walks are two feet in width. This house is heated by steam, from a boiler which is used for heating all the Station buildings, and which carries a uniform pressure of five pounds of steam, day and night. Entering the house by an overhead flow, the steam passes the length of the house, then downward, and returns through coils of pipe under the benches. There are two coils under each of the three benches in either division of the house. Each coil is provided with a valve, so that steam may be passed through any or all of the six different coils, or may be shut off entirely; an arrangement which gives perfect control of the house temperature, even in extremely variable weather.

Ventilation is secured by a continuous line of ventilating sash along the south side, hinged at the ridge.

The north and south walls are both solid (containing no glass). The height of the former is twenty-one inches above the top of the bench, and that of the latter thirty-eight inches. This house has proven to be well adapted for forcing crops which need a high temperature.

Benches and Plots.

The bench selected for our experiments, because thought to have the most favorable exposure, was the centre bench in the east end. This bench runs east and west and is nine inches deep, having a bottom of six inch boards laid three-fourths of an inch apart for drainage. The spaces between the boards were covered with coarse peat, so that none of the soil could escape when the benches were filled. The bench was divided into five plots, each three feet, six and one-half inches by three feet eleven inches, and having an area of 1997½ square inches or 13.87 square feet.

The soil filled the plots to a depth of about eight inches, leaving abundant room after settling for watering. Six plants were set in each plot.

Preparation of the Artificial Soil.

The soil for each plot was separately mixed as follows: 300 pounds of anthracite coal ashes, sifted to pass a wire screen with four meshes to the inch, were spread on a cement floor, and nine pounds of peat moss, such as is sold in the cities for stable bedding, screened like the ashes, were scattered over them. To these were added three and one-half ounces of precipitated carbonate of lime, to neutralize a slight acidity of the peat and give to the whole a mild alkaline reaction. These materials were shoveled over twice carefully and then spread as before.

The fertilizers designed for the plot were sprinkled over this mixture and the whole was carefully shoveled over twice again to secure as perfect a mixture as possible of fertilizers and soil and then carried in a hand-barrow to the designated plot in the forcing house.

The north bench in the same division of the house was filled with a rich soil prepared by composting good thick turf with one-third its bulk of stable manure. Plants were set in this bench mainly to make a rough comparison between crops grown on the two radically different soils. The exposure of the two benches is slightly different, that of the north bench being, perhaps, somewhat less favorable as regards light. The plants set in the north bench were also much closer together. The fertilizers used on the several plots may be seen from the table given on page 82.

Plants.

Three varieties were used: Ignotum, Acme and Dwarf Champion, two plants of each variety being set in each plot, and all receiving the same treatment.

The plants were grown from seed sown in flats about September 1st. The seedlings were potted in due time and later shifted to four inch pots, where they remained till they could be set in the plots of the forcing house benches. The earth about the roots was not disturbed in transplanting to the plots, but was sunk in the artificial soil with the plant, so that about two inches of the stem was covered with the soil. Plants were set in the plots of natural soil on December 7th, but could not be set in the artificial soil, plots 4–8, till December 31st, 1894, and January 1st, 1895.

Owing to delay in building the forcing house, the plants were all somewhat "drawn," or "leggy," when placed in the plots. They, however, outgrew their legginess in a large measure, developing into fairly normal specimens, with every appearance of thrift (where the plant food was sufficient) and bearing fruit satisfactorily.

Care during Growth.

The method of training adopted was the "single stem" system, which has been used successfully at the New York Cornell Station. By this system plants can be set closer, and while the yield may be much less *per plant* than under other systems of training, it is as large or larger per square foot of bench-area devoted to the crop.

The plants blossomed soon after setting. The first pollinating was done January 5th. Pollination was effected by holding a spoon directly under each flower and gently tapping the upper part of the blossom with a pencil or small stick. Pollen is thus shaken into the spoon and at the same time the stigma is driven into the mass of loose pollen in the bottom of the spoon. The stigmatic surface which is on the end of the style is thus coated with pollen, and as flower after flower is visited on many different plants, cross-fertilization is insured. Flowers were pollinated about every other day throughout the blossoming period.

The plants in all the plots grew finely for a time, though as early as January 8th a slight difference of color was noticeable between the plants in plot 4, which had received no nitrate of soda, and the others; the former being lighter in color. This difference increased through the season.

Plants of the Acme variety were the first to blossom; the others followed next day.

In January a slight curling of the young leaves upon the tips of the most vigorous plants was quite marked. More air and less water righted the difficulty, so that apparently no injurious results followed. This curling was more marked upon plants grown in the natural soil, than upon those grown in the artificial soil.

February 12, the plants growing in plots 6, 7 and 8 were slightly darker in color than those in plot 5. A very slight attack of rot (*Macrosporium tomato*) was first noticed on plants grown in natural soil.

February 24th: A gradation in the color of the plants was very noticeable, being darker green in each successive plot where the amount of nitrate of soda added was greater.

February 27th: The first tomatoes were harvested; three Ignotums from plot 5 and one from plot 8 (artificial soil), and two Ignotums and three Acmes from plot 1 (natural soil).

It was necessary to trim the plants from time to time to give them air and sunlight, as well as for greater convenience in cultivating the soil and gathering the fruit.

The trimmings were saved, and later, together with the plants (stems and foliage), submitted to the chemists for examination.

The plots were watered by the gardener's rule, "Water a plant when it needs it." Judgment alone must determine this. Water was applied from a hose on the surface of the soil and at no time was the soil drenched, so that any loss of fertilizers would occur by leaching. The soil was cultivated every few days with a hand weeder to loosen up the surface and check evaporation. In order to keep the atmosphere moist, the walks were wet down every day between nine and ten o'clock, and again in the afternoon on warm sunny days. The plants were never syringed.

The temperature of the house ranged from 60° to 65° Fahr. during the night and from 10° to 15° higher through the day. On warm sunny days the thermometer often registered 85° and even 90°.

Harvesting.

While the color, size and general appearance of the plants give valuable indications, yet as the tomato is grown for its fruit alone, it is in the fruit that we must look for the measure of the practical value of application of fertilizers.

In order to collect all the necessary data on this point, an accurate record of each plant was kept, with the weight and measure of each individual tomato produced by it and with additional notes regarding form, color, etc. Each plant was numbered and each tomato was weighed, the weight (in grams) recorded, and the greatest circumference, determined by passing a measuring tape around the tomato in a plane at right angles to the axis of the fruit, was also recorded.

Chemical Analyses of the Crops.

When the plants were all bearing freely, a number of fruits of both the Acme and Ignotum variety were separately gathered from plants on each of the plots, 4, 5, 6, 7 and 8, and analyzed to determine the amounts of nitrogen, phosphoric acid and potash removed from the several plots in the crops, and incidentally to see if there were any marked differences in the composition of the two varieties of tomatoes or in the composition of the crops on the several plots.

At the close of the experiment the vines and leaves, with the leaves that had been trimmed out during the growing season, were also analyzed, to determine how much nitrogen, phosphoric acid and potash remained in them. It was impracticable to analyze the roots, as no satisfactory separation could be made from the ashes and peat, which do not separate nearly as readily from root fibers as soil.

Tabular Statement of the Plan of the Experiments and the Results.

We give below in tables the statements of yields and composition of tomatoes and vines, followed by a discussion of them.

TABLE I.—TOMATO EXPERIMENT. FERTILIZERS APPLIED AND CROPS HARVESTED.

Fertilizers applied in grams.	Plot 4.			Plot 5.			Plot 6.			Plot 7.			Plot 8.		
Nitrate of Soda	none.			68.1			113.5			158.9			204.2*		
Equivalent Nitrogen	----			10.9			18.2			25.4			32.7		
Dissolved Bone Black	none.			47.9			47.9			47.9			47.9		
Equivalent Phosphoric Acid	----			8.1			8.1			8.1			8.1		
Muriate of Potash	none.			58.6			58.6			58.6			58.6		
Equivalent Potash	----			29.3			29.3			29.3			29.3		
Total yield of fruit, grams	316			4840			8331			10505			12522		
Variety	Ignotum.	Acme.	Dwarf Champion.	Ignotum.	Acme.	Dwarf Champion.	Ignotum.	Acme.	Dwarf Champion.	Ignotum.	Acme.	Dwarf Champion.	Ignotum.	Acme.	Dwarf Champion.
Yield of each variety, 2 plants, grams	120	155	41	1934	1853	1053	2285	3870	2176	3081	4421	3003	4194	5205	3123
Average yield per plant, grams	60	77.5	20.5	967	926.5	526.5	1142.5	1935	1088	1540.5	2210.5	1501.5	2097	2602.5	1561.5
" " " pounds	.13	.17	.04	2.13	2.04	1.16	2.52	4.27	2.40	3.40	4.88	3.31	4.63	5.74	3.44
Average number fruits per plant	1	1.5	.5	8	12.5	6	8	18.5	11.5	12	19.5	19.5	23.5	23.5	16
Average weight per fruit, grams	60	51.6	41	120.8	74.1	87.7	142.8	104.6	94.6	124.2	113.3	77	89.2	110.7	97.5
Average number of double fruits	0	0	0	0	0	0	.5	1	0	3	.5	.5	0	1.5	.5
" " perfect shaped fruits	0	1.5	.5	0	4.5	2	4	3.5	3.5	3	10.5	7.5	3	11.5	4
Per cent. of perfect shaped fruits	0	100	100	0	36	33	50	19	30	25	51	38	13	48	25
Average yield per square foot of bench area grams	25.95	32.52	8.86	418.34	400.82	227.77	494.26	837.11	470.69	666.45	956.30	619.58	907.20	1125.89	675.52
Average yield per square foot of bench area, pounds	.057	.074	.012	.92	.88	.50	1.09	1.84	1.03	1.47	2.11	1.21	2.00	2.48	1.48

* One-half mixed with the soil at setting time, the rest spread on the surface, Feb. 11.

TABLE III.—COMPOSITION OF TOMATO VINES AND LEAVES AND OF FRUIT.

	AIR-DRY TOMATO VINES AND LEAVES.					FRESH TOMATO FRUIT.									
						Acme Variety.				Ignotum Variety.				Average of	
	Plot 4. %	Plot 5. %	Plot 6. %	Plot 7. %	Plot 8. %	Plot 5. %	Plot 6. %	Plot 7. %	Plot 8. %	Plot 5. %	Plot 6. %	Plot 7. %	Plot 8. %	18 Maryland Analyses.*	12 New Jersey Analyses.†
Water	3.92	7.57	7.90	7.81	8.02	93.41	94.07	94.17	94.81	93.97	94.53	94.54	94.79	94.75	
Phosphoric Acid	1.85	.92	.64	.49	.51	.066	.052	.052	.053	.062	.057	.061	.059		
Potash	2.69	3.84	3.88	3.58	3.44	.356	.295	.334	.287	.339	.338	.345	.303		
Nitrogen	.73	.95	1.00	1.12	1.38	.079	.089	.118	.139	.082	.099	.118	.145		
						WATER-FREE.									
Phosphoric Acid	1.91	.99	.70	.53	.56	1.00	.87	.90	1.02	1.03	1.04	1.11	1.13	1.01	1.13
Potash	2.80	4.15	4.21	3.90	2.65	5.40	4.97	5.73	5.53	5.62	6.19	6.32	5.81	5.93	4.31
Nitrogen	.76	1.03	1.09	1.21	1.50	1.20	1.50	2.03	2.68	1.36	1.81	2.16	2.78	3.35	2.09

* Md. Sta. Bull. 11. Raised in field.

† N. J. Sta. Bull. 63. Raised in field.

TABLE IV.—QUANTITIES OF NITROGEN, PHOSPHORIC ACID AND POTASH, TAKEN FROM EACH PLOT BY CROP (IN GRAMS).

	Plot 4.			Plot 5.			Plot 6.			Plot 7.			Plot 8.		
	Fruit.	Vines.	Total.	Fruit.	Vines.	Total.	Fruit.	Vines.	Total.	Fruit.	Vines.	Total.	Fruit.	Vines.	Total.
Nitrogen	.25	.30	.55	3.88	2.46	6.34	7.64	3.61	11.25	12.40	4.61	17.01	17.66	5.57	23.23
Phosphoric Acid	.20	.75	.95	3.12	2.38	5.50	4.45	2.31	6.76	5.74	2.02	7.76	6.89	2.06	8.95
Potash	1.11	1.09	2.20	16.90	9.95	26.85	25.56	13.99	39.55	35.43	14.73	50.16	36.61	9.85	46.46

TABLE II.—YIELD OF AIR-DRY VINES AND OF FRESH FRUIT ON EACH PLOT (IN GRAMS).

	Vines.	Fruit.
Plot 4	40.5	316
" 5	259.0	4,840
" 6	360.5	8,331
" 7	411.5	10,505
" 8	403.5	12,522

DISCUSSION OF THE CHEMICAL DATA OF THE EXPERIMENT.

1. The artificial soil of itself contained very little, if any, nitrogen available to tomatoes. Six plants with their fruit growing on it contained only half a gram (seven and one-half grains) of nitrogen, and a portion of this came from the young plants and their adhering earth, which were set in this artificial soil.

2. The four plots, 5, 6, 7, 8, with regularly increased applications of nitrogen, show an increasing yield of fruit, of average number of fruits per plant, and of nitrogen, phosphoric acid and potash* in the crop. Table V. presents these facts :

TABLE V.—STATISTICS REGARDING THE CROPS OF TOMATOES (FRUIT AND VINES) ON THE FIVE PLOTS OF ARTIFICIAL SOIL.

	Amount of Nitrogen-added.	Weight of Fruit	Average number of Fruits per plant.	Average weight of a single Fruit.	Yield of Crops in		
					Nitrogen.	Phos. Acid.	Potash.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.
Plot 4	0.0	316	1.0	50.8	.55	.95	2.20
Plot 5	10.9	4840	8.8	99.6	6.34	5.50	26.85
Plot 6	18.2	8331	12.6	112.5	11.25	6.76	39.55
Plot 7	25.4	10505	17.0	103.1	17.01	7.76	50.16
Plot 8	32.7	12522	21.0	99.1	23.23	8.95	46.46

It is altogether probable that the tomato plants in this experiment needed more than the quantity of nitrogen applied to plot 8, in order to yield their maximum crop. Of the total nitrogen added, at least 58 per cent. was taken by the crop on plot 6, 65 per cent. on plot 7, and 69 per cent. on plot 8. This increased per cent. of assimilation also indicates that the plants that received most nitrogen still had no excess.

3.—It appears also that the quantities of both phosphoric acid and potash which were added to the plots in fertilizers, were entirely insufficient for the needs of the maximum tomato crop, but that the plants were able to obtain some phosphoric acid and very considerable quantities of potash from the coal ashes. The following statement shows this :

---

* Excepting Plot 8.

TABLE VI.—QUANTITIES OF PHOSPHORIC ACID AND POTASH IN THE FERTILIZER AND IN THE CROP (FRUIT AND VINES).

	Plot 5. Grams.	Plot 6. Grams.	Plot 7. Grams.	Plot 8. Grams.
Phosphoric Acid applied	8.14	8.14	8.14	8.14
Phosphoric Acid harvested	5.50	6.76	7.76	8.95
Potash applied	29.30	29.30	29.30	29.30
Potash harvested	26.85	39.55	50.16	46.46

On three of the plots the potash added in fertilizers was certainly insufficient, and on two at least phosphoric acid was deficient.

Whether the chemical fertilizers and the coal ashes together supplied all the potash and phosphoric acid which the crops needed, or whether the plants on plot 8 suffered for lack of potash or phosphoric acid as well as of nitrogen, cannot now be determined.

It is not certain that the available potash and phosphoric acid came from the coal ashes themselves. Possibly the kindlings or waste, which is sometimes burned in the furnace in very small amount, supplied them.

4.—Tomato plants grown in artificial soil, under the conditions of our experiment, actually removed from the soil in fruit, vines, and leaves :

	Per Plant. Grams.	Per 100 square feet of bench. Grams.
Nitrogen	3.87	167.5
Phosphoric Acid	1.49	64.5
Potash	8.36	361.7

These are equivalent to the following quantities of nitrate of soda (16 per cent. nitrogen), dissolved bone black (17 per cent. available phosphoric acid) and muriate of potash (50 per cent. potash).

	Per Plant. Grams.	Ounces.	Per 100 square feet of bench. Pounds and Ounces.
Nitrate of Soda	24.2	.86	2 and 5
Dissolved Bone Black	8.8	.31	0 and 13
Muriate of Potash	16.7	.59	1 and 9

These are the quantities actually contained in the crop, exclusive of the root system.

If the soil used were quite free from all available nitrogen, phosphoric acid and potash, from one-third to one-half or even more than the quantities named might be needed to produce the crop, because, as our vegetation experiments and those of others have indicated, plants are not able to assimilate, even in extreme cases, more than 75 or 80 per cent. of the soluble plant food in the soil, and because in these observations no account has been taken of the fertilizing materials contained in the roots.

5.—The composition of the two varieties of tomatoes as respects ingredients named in the table, is very nearly alike, the Ignotum in every case having a very slightly higher percentage of nitrogen, phosphoric acid and potash, than the Acme.

The average of twelve analyses of the dry matter of tomatoes raised in the field, differently fertilized, New Jersey Agricultural Station Bulletin 63, and also the average of eighteen analyses, Maryland Agricultural Station, Bulletin 11, are given in the table on page 83. The comparison shows that as far as these four ingredients were concerned normal fruit was raised in this artificial soil with commercial fertilizers.

6.—Every 100 pounds of ripe tomatoes removed from the soil the equivalent of:

400 grams or 14 ounces of Nitrate of Soda.
147 grams or 5 ounces of Dissolved Bone Black.
266 grams or 10 ounces of Muriate of Potash.

Discussion of the Horticultural Data.

The increase of weight of the crops of each variety, with each successive increase in the nitrogen added in the fertilizer, and the like increase in the average number of fruits per plant of each variety, have already been discussed.

1.—The highest average weight per fruit of the Ignotum variety was on plot 6, of the Acme on plot 7, and of the Dwarf Champion on plot 8.

2.—The tendency to bear double flowers, which produced irregular-shaped fruit, seemed to bear no relation to the quantity of nitrogen applied, nor to the variety. The same plant produced both single and double blossoms.

3.—The number of perfect fruits was absolutely larger on the plots receiving most nitrogen, but there was no very marked relative increase in number.

Bailey found*, however, that plots which were most highly fertilized gave the smoothest fruit.

4.—Comparison of the three varieties shows that Acme gave the largest yield in artificial soil, but the yield of Ignotum was considerably the largest of the three, when grown in rich garden soil.

Acme gave the greatest average number of tomatoes per plant, while the average weight per fruit of Ignotum was considerably greater than that of the other varieties.

5.—The Dwarf Champion proved to be an unprofitable variety in this test.

6.—Tomatoes from the unfertilized plot (Plot 4) were small, smooth and of good shape, but the color was not normal. They were too light in color and slightly rusty-looking,—having a faded appearance. The flesh of the tomato was very dry, and sweet to the taste—much sweeter than tomatoes from other plots.

Tomatoes of best form, size and color grew upon plots 6 and 7. Those from plot 8 (and a few from plot 7) ripened very unevenly, and were green about the stem when the other side of the fruit was of good color and apparently ripe. These tomatoes had a decided tendency toward softness while still green; the form and size were very good.

Comparison of Plants Grown in Natural Soil with those Grown in Artificial Soil.

As has been noted above, there were, in the same house with the experimental plots, a considerable number of plants grown in natural soil prepared as described on page 79. These were set much closer in the bench than those grown in artificial soil. The latter had a bench space of 2.31 square feet per plant, the former about 1.15 square feet.

The plants in soil had three weeks the start of those in ashes and peat, being set in the beds on December 7th, while the plants were not set in the ashes and peat until December 31st.

These facts render any very strict comparison of the two impossible, nor was strict comparison intended when the experiment was begun.

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* Cornell Station Bulletin No. 10, page 116.

The following facts, however, deserve notice. In what follows we refer only to the crops grown on plots 7 and 8. The others, 4, 5 and 6, had no adequate supply of nitrogen, and it must also be borne in mind that plots 7 and 8 in all probability did not have a full supply of either nitrogen, phosphoric acid or potash. The tomatoes grown in ashes and peat grew and fruited much more rapidly than those in natural soil, and then suddenly stopped their growth and bearing, the leaves turned brown and the plants appeared to be dead. They were not dead, however, by any means, and after cutting back to near the roots and *supplying more fertilizers*, they made a new and vigorous growth and fruited again.

The plants grown in natural soil, however, kept bearing a little fruit till the following July, when they were thrown out to make room for other experiments.

We believe the plants in peat and ashes fruited more quickly and abundantly, because they had at first a larger supply of soluble plant food than those in natural soil :—that when that was exhausted, they had no resource and died back in consequence :—that if they had been sufficiently fertilized, they would have proved far more prolific and profitable than those in natural soil. To decide this will be one point in next year's experiments.

The following statement gives the average yield per plant of the three varieties (4 plants of each) on plot 8 in artificial soil with commercial fertilizers, also the average yield per plant (an equal number of each of the three varieties was used to calculate this) of the three varieties grown in rich natural soil up to April 17th, the date when, as already described, the plants in artificial soil died back for lack of nourishment. Up to this date the plants had been growing in the natural soil three weeks longer than in the artificial soil. The total yield of the plants in natural soil, up to July 16th, is also given, though after the middle of April there is little or no profit in forcing-house tomatoes.

TABLE VII.—AVERAGE YIELD PER PLANT IN NATURAL AND IN ARTIFICIAL SOILS.

	Peat and Ashes with Fertilizers.	Natural Soil.	
	To April 17th.	To April 17th.	To July 16th.
Yield per Plant (grams)	2087	976	1820
Yield per Plant (pounds)	4.59	2.15	4.00
Number of Fruits per Plant	21	10.4	22.7
Weight of Fruits (grams)	99.1	91.7	82.4
Yield per square foot (grams)	904	847.0	1583
Yield per square foot (pounds)	1.99	1.86	3.5

The table shows that up to the time when the fertilizers in the artificial soil were proved (by the chemical analyses) to be exhausted, the plants in artificial soil had produced, per square foot of bench space, seven per cent. more tomatoes than those in the natural soil, while the latter had, up to that time, three weeks more of growing season.

It is possible that the plants in natural soil, if they had been set further apart, would have, in the same time, made a larger crop per foot of bench space. It is possible too, that with an increased supply of fertilizers the plants in artificial soil would have given a largely increased yield. We cite these figures only to show that the tomato crop can be successfully grown in a soil made of ashes and peat, such as we have described, with the aid of commercial fertilizers.

SUMMARY.

1.—A forcing-house tomato crop yielding about two pounds of fruit for each square foot of bench room, takes in the vines and fruit, for every hundred square feet of bench space, not less than:

	Grams.		Pounds.	Ounces.
Nitrogen	168	Equivalent to Nitrate of Soda	2	5
Phosphoric Acid	65	" " Dissolved Bone Black	0	13
Potash	362	" " Muriate of Potash	1	9

Of this from a fourth to a fifth only is in the vines.

2.—To enable the plants to get these fertilizer elements as required, there should be a large excess of them in the soil, perhaps double the quantity given above.

3.—Every 100 pounds of tomato fruit takes from the soil approximately:

	Ounces.		Ounces.
Nitrogen	2.2	Equivalent to Nitrate of Soda	14
Phosphoric Acid	0.9	" " Dissolved Bone Black	5
Potash	4.6	" " Muriate of Potash	10

4.—It is possible to grow a crop of forcing-house tomatoes, amounting to two or more pounds per square foot of bench space, perfectly normal in size, color, taste and chemical composition, by the aid of commercial fertilizers alone, and in soil composed of coal ashes and peat.

The scope of these experiments has been considerably enlarged and they will be continued during the season of 1895 and 1896.

THE USE OF AN ARTIFICIAL SOIL AND COMMERCIAL FERTILIZERS IN FORCING-HOUSES.

By E. H. Jenkins and W. E. Britton.

We are not at present prepared to recommend any departure from those methods of raising a forcing-house crop of tomatoes which experience has approved.

The experiments of a single season and of a single observer, and on the very small scale made necessary by our limited space, are necessarily quite inconclusive.

Moreover these experiments were not undertaken with the object of learning whether artificial soil could be generally used in forcing-houses as a substitute for natural soil, but solely to determine how much nitrogen in the soil was necessary for the full development of the tomato plant.

Yet we feel justified in calling attention to certain apparent advantages in using the artificial soil which we have described.

Cost.

For every 100 square feet of bench space, about 2200 pounds of sifted coal ashes and 63 pounds of dried peat or leaf mold is required to fill the bench eight inches deep with soil. Experiments are now in progress to determine whether the use of peat is necessary.

About 10 pounds of commercial fertilizers are needed for this bench space, costing, at present ruling ton rates, less than 21 cents. The cost of these things is to be compared with the cost of providing a considerably greater weight of rich compost containing a large relative amount of stable manure.

In very many cases, the cost of filling the benches with the artificial soil must be very much less than the cost of filling them with rich garden soil.

Early Maturing of Crop.

The greatest expense in running a forcing-house is the artificial heat required, and for this reason, quick growth and early maturity are extremely desirable. Regarding the relative availability of the potash and phosphates in compost and in commercial fertilizers, we know little, but it is very certain that the nitrogen of composts is slowly available as compared with the nitrogen of nitrates.

Our tomato tests above described showed too, very clearly, that plants in natural soil made much slower growth and were slower in fruiting than those in artificial soil supplied with nitrates. Though the former were set fully three weeks earlier, both began fruiting at the same time. These facts have already been shown on page 89.

Freedom from Insects and Fungi.

The coal ashes, which constitute about 97 per cent. of the artificial soil, are of course absolutely free from all forms of life, when taken for forcing-house use. This is, by itself considered, an advantage.

The peat, while by no means free from low forms of life, is yet far less adapted to their existence and growth than the rich garden soil. It was noticed, when the benches were cleared out in the summer, that the wood under the artificial soil was hard and sound, while under the natural soil it had decayed quite perceptibly in a single season through the agency of the microbe life in the soil, of which the artificial soil was comparatively destitute.

Freedom from Nematodes in Particular.

Tomatoes grown under glass are usually attacked at the root by a species of small worms known as Nematodes (*Heterodera radicicola*), which induces the well known root-galls.

The soil becomes so infested with these worms that it cannot be used two seasons in succession for tomatoes.

The practice, therefore, is to throw it out and let it lie over one winter. Freezing the soil greatly diminishes the number of the nematodes, so that it can be used in the forcing-house again the third season.

Wherever natural soil was used in our tests, we found the roots thoroughly infested with nematodes and covered with galls. On the contrary, where artificial soil was used, no root-galls whatever were found beyond the ball of earth set with the plant. In this they were quite abundant.

ON THE CHEMICAL COMPOSITION OF LETTUCE GROWN IN THE FORCING-HOUSE.

By E. H. Jenkins and W. E. Britton.

Experiments of the same kind as those fully described in the previous paper, page 75 of this Report, have been made with lettuce.

Extended notice of them is deferred till further tests are completed, but the following data have value apart from their connection with our special line of work and are accordingly given here.

The house was not well adapted for growing lettuce, being fitted with benches and bottom heat instead of solid beds.

Each plot, 3 feet 11 inches by 2 feet 11½ inches, had an area of 11⅗ square feet and 200 pounds of the peat and ashes mixture filled it to the depth of six inches. The mixture contained five per cent of peat moss.

The variety of lettuce grown was Simpson's White Seeded Tennis Ball. The seed was sown in flats and as soon as the plants were large enough to handle they were pricked out four inches apart each way on the bench. They remained here until ready to be transferred to the experimental plots, when they were set eight inches apart each way, making thirty plants in each plot.

The quantities of plant food added to this soil are shown in the table, which also presents in detail the results of the experiment.

When the crop was harvested, the lettuce heads were cut close to the surface of the soil, immediately weighed in their fresh condition, and dried for analysis.

The roots were pulled and the soil separated as well as could be, but as is seen by the large amount of matter "insoluble in acid" the separation was quite imperfect and a part of the fertilizing elements found on analysis had not really entered the roots, but was in the adhering soil. The chemical analyses were made by Messrs. Winton and Ogden.

TABLE I.—FERTILIZERS APPLIED AND CROPS HARVESTED (IN GRAMS).

Fertilizers applied.	Plot 38.	Plot 39.	Plot 40.	Plot 41.
Nitrogen	7.11	11.85	16.59	21.34
Equivalent Nitrate of Soda	44.4	74.0	103.7	133.4
Phosphoric Acid	6.80	6.80	6.80	6.80
Equivalent dissolved Bone Black	40.0	40.0	40.0	40.0
Potash	24.24	24.24	24.24	24.24
Equivalent Muriate of Potash	48.5	48.5	48.5	48.5
Crops harvested.				
Lettuce Heads	1232.8	2217.6	2720.6	3083.1
Lettuce Roots*	219.6	361.3	368.4	368.5
Total	1452.4	2578.9	3089.0	3451.6
Dry Substance of Crop	205.5	346.2	349.56	358.33

TABLE II.—COMPOSITION OF THE FRESH PLANTS.

	Plot 38,		Plot 39.		Plot 40.		Plot 41.	
	Roots.	Heads.	Roots.	Heads.	Roots.	Heads.	Roots.	Heads.
Water	60.66	90.33	53.84	91.89	60.16	92.56	60.82	93.06
Nitrogen	.196	.186	.237	.221	.235	.236	.229	.247
Phosphoric Acid	.148	.100	.130	.088	.102	.076	.103	.073
Potash	.292	.563	.293	.564	.321	.566	.317	.566
Insoluble in Acid	20.76	----	27.69	----	22.31	----	21.87	----

TABLE III.—THE QUANTITIES OF NITROGEN, PHOSPHORIC ACID AND POTASH TAKEN UP BY THE CROPS (IN GRAMS).

	Plot 38.			Plot 39.			Plot 40.			Plot 41.		
	Roots.	Heads.	Total.	Roots.	Heads.	Total.	Roots.	Heads.	Total.	Roots.	Heads.	Total.
Nitrogen	.43	2.29	2.72	.86	4.90	5.76	.87	6.41	7.28	.85	7.63	8.48
Phosphoric Acid	.32	1.22	1.54	.47	1.94	2.41	.37	2.07	2.44	.38	2.25	2.63
Potash	.64	6.94	7.58	1.06	12.52	13.58	1.18	15.40	16.58	1.17	17.46	18.63
Ratio of Phosphoric Acid to Nitrogen and Potash	1:1.8:4.9			1:2.4:5.6			1:3.0:6.8			1:3.2:7.0		

The facts which this experiment has developed may be summarized as follows:

1. Lettuce of good quality can be grown under glass in an artificial soil such as we have described, with the use of commercial fertilizers.

We are not prepared to say at present that its quality is as good as the best lettuce grown in rich, natural soil.

2. A crop of forcing-house lettuce, raised as above described, takes from the soil in roots and heads, per 1000 heads, not less than:

	Grams.		Pounds.	Ounces.	
Nitrogen	282.6	Equivalent to	3	15	Nitrate of Soda
Phosphoric Acid	87.7	"	1	2	Dissolved Bone Black.
Potash	621.0	"	2	10	Muriate of Potash.

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* With much adhering soil.

3. To supply this plant food to the soil under the conditions of our experiment, it was necessary to add to the soil the following quantities of fertilizers per 1000 plants, or per 387 square feet, the area used in our experiment for 1000 plants.

	Pounds.	Ounces.	Costing cents.
Nitrate of Soda	9	13	25
Dissolved Bone Black	2	15	4
Muriate of Potash	3	8	7
			36

Loss of Fertilizer-Nitrogen.

It may not be out of place, in a discussion of the nitrogen-supply for the soil of forcing houses, to call attention to some recent observations regarding the loss of nitrogen, not only from stable manure itself, but from nitrogenous fertilizers of various kinds, nitrates, ammonia salts, urine, fresh vegetable matter, etc., when they are used in connection with stable manure.

It has been known for some time that in full access of air, the nitrogen of nitrates as well as that of organic matters occurring in manure, may be lost as nitrogen gas by the action of microbes.

That losses similar in kind, if much less considerable in amount, may occur in soils, is perhaps not as fully established, but seems quite probable.

Wagner, as the result of carefully made vegetation experiments, concludes that the nitrogen of *well rotted* stable manure is very much less readily available to plants than has been generally supposed. In Wagner's trials the availability of the nitrogen of nitrates being taken as 100 per cent., that of the nitrogen of rotted stable manure was about 45 per cent., while that of various other organic matters commonly used as fertilizers ranged from 60 to 70 per cent.

On the other hand, Kühn found as a result of somewhat similar tests, that if the availability of the nitrogen of sulphate of ammonia (itself a little less quickly available than nitric nitrogen perhaps) was called 100 per cent., that of *fresh* cattle dung was 92 per cent.

This disagreement between the observations of the two experimenters is to be explained probably by differences in the kind of microbe life of the soil or manure, or in the conditions affecting this microbe life, during the course of the experiment, depending on the age and keeping of the stable manure or dung.

In connection with his experiments, Wagner observed that nitrates dissolved in a water-extract of *fresh* horse dung, were destroyed with liberation of free nitrogen. When its microbes are killed dung does not have this effect.

What is particularly new and striking in Wagner's observations, however, is that *fresh* dung used with nitrates or with green vegetable substances as a fertilizer, may so depress their fertilizing effect, that the increase of crops secured by the horse dung and nitrates, etc., together, may be less than is produced by the nitrates, etc., alone. The following statement of the yields, in one of his experiments, shows this fact :

No. of Experiment.		Fertilizer used.	Dry matter of Crop (grams).	Of 100 parts of nitrogen in fertilizer there was recovered in the Crops
1	Without fresh horse-dung.	No added nitrogen	13.5	----
2		1 gram nitrogen added as nitrate	85.7	65
3		1 gram nitrogen added as green vegetable matter	74.6	38
4	With fresh horse-dung, supplying 2 grams nitrogen.	No added nitrogen	2.9	----
5		1 gram nitrogen added as nitrate	50.7	10
6		1 gram nitrogen added as green vegetable matter	15.1	4

Here it appears that soil, to which were added three grams of nitrogen, viz: two grams in form of *fresh* horse dung and one gram in form of nitrate of soda, yielded a very considerably smaller crop than the same soil to which one gram of nitrate nitrogen was added *without* dung.

This, according to Wagner, is explained by the fact that the microbes in the *fresh* dung expelled nitrogen in the gaseous form, both from the dung itself and from the nitrate, before vegetation could assimilate it.

While the horse dung applied in Wagner's trials was fresh and the quantities were much larger than are ordinarily used in farm practice, yet the facts above cited have a very important bearing on the use of fresh stable manure and possibly on the value of composts, such as are used for forcing-house soil, in which the proportion of stable manure is approximately near to that which was used in Wagner's tests, where a large loss of nitrogen was observed.

It might, therefore, happen that applications of nitrates or other nitrogenous fertilizers to the soil of the forcing-house, would have no marked effect on the crop, while nevertheless available nitrogen was deficient and the crop suffering in consequence. This result might at least be expected to follow the use of fresh-manure water.

A few observations made at this Station bearing on this subject may here be recorded :

Fifty grams of surface soil from the Station garden, (which is annually dressed liberally with mixed cow and horse manure and with fertilizer chemicals), 50 grams of fresh cow dung and 50 grams of fresh horse dung were stirred up with water, each in a separate vessel and the muddy liquids were strained through tufts of glass wool. This was repeated till the volume of the filtered liquid amounted in each case to 750 c. c. To each was then added five grams of sodium nitrate and water to make 1000 c. c.

Nitrogen as nitrates was immediately determined in each solution. The flasks were tightly stoppered and kept in a closet, nearly dark. From time to time nitrogen was again determined, as shown in the following statement, which gives the weight of nitric nitrogen (in grams) found in 25 c. c. of these solutions on the dates named and the corresponding per cent. loss of nitrogen:

	Nitrate with extract of garden earth.		Nitrate with extract of fresh horse-dung.		Nitrate with extract of fresh cow-dung.	
	Nitrogen.	Per cent. loss.	Nitrogen.	Per cent. loss.	Nitrogen.	Per cent. loss.
March 23	.0195	----	.0190	----	.0192	----
March 30	.0196	----	.0172	*9.5*	.0178	*7.3*
April 5	.0193	*1.0*	.0166	*12.6*	.0180	*6.3*
April 23	.0190	*2.6*	.0160	*15.8*	.0171	*10.9*
May 24	.0195	----	.0155	*18.4*	.0173	*9.9*
Nov. 20	.0193	*1.0*	.0160	*15.8*	.0165	*14.1*
Jan. 28	.0186	*4.6*	.0167	*12.1*	.0162	*15.6*

It appears that in the extract of garden soil, very little nitrogen was lost through reduction of nitrates during ten months.

The extracts of fresh horse dung and fresh cow dung, caused considerable loss of nitrogen from the nitrates by reduction. The reduction by the extract of cow dung was in this experiment somewhat slower and less in amount than that of the horse dung.

While the gains and losses of nitrate nitrogen in several cases are within the limits of analytical error, it is probable that in the extract of horse-dung after May 24, nitrates began to increase by nitrification of the organic nitrogen.

In a further experiment two extracts were prepared in precisely the way above described, the one from 50 grams of fresh horse dung, the other from 50 grams of a potting soil prepared for use in the forcing house. This was made of pasture sod and the soil just beneath, composted with about one-third their bulk of mixed horse and cow manure. The mixture made in the summer of 1894 had stood in a conical compact pile, exposed till the fall of 1895. The soil for this experiment was taken from the interior of this pile at a depth of 2–3 feet.

To each of the extracts prepared as above and measuring 1000 c.c., five grams of nitrate of soda were added.

The following table shows the quantity of nitrogen as nitrates and the losses found at various dates in these two preparations :

	Extract of Potting Soil.		Extract of fresh horse-dung.	
	Nitrogen.	Per cent. loss.	Nitrogen.	Per cent. loss.
Nov. 22......	.0201	....	.0200	....
Dec. 21......	.0194	*3.5*	.0192	*4.0*
Jan. 28......	.0186	*7.5*	.0164	*18.0*

While the surface soil of the garden referred to on page 94, although heavily dressed each year with stable manure, had little or no effect in destroying nitrates, the potting earth (made by composting contiguous pasture sod and a few inches of underlying soil with stable manure), reduced nitrates to about half the extent caused by fresh horse dung.

This result is in accord with familiar facts. The surface soil of tilled ground is commonly or always charged with oxidizing and nitrifying organisms. Fresh and damp compost heaps where vegetable or animal matters are abundant and the soil of forests, low meadows and bogs, contain little or no nitrates, and their bacterial growths are of the deoxidizing or reducing kinds. It is probable that, near the surface of the heap of potting earth, nitrifying organisms were abundant at the very time when the sample taken from the interior was found to have a denitrifying effect.

Accordingly the use of potting earth from the exterior of a compost heap may occasion no loss of nitrate-nitrogen, while earth from the interior of the heap may reduce nitrates and cause serious waste of any nitrate that is applied as a fertilizer.

It is therefore advisable, sometime before using potting compost, to place it under cover away from rain, and to intermix it thoroughly and frequently and to keep it in rather shallow heaps.

VEGETATION EXPERIMENTS ON THE AVAILABILITY OF NITROGEN IN CERTAIN NITROGENOUS MATERIALS.

By S. W. Johnson, W. E. Britton and E. H. Jenkins.

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The experiments here described are a continuation of work done in previous years, references to which are given in the Eighteenth Report of this Station, 1894, page 73.

Mr. Britton has had entire charge of the preparation of the seed and soil, filling the pots and caring for the crops through the whole period of growth.

All the chemical work involved has been done by Messrs. Winton and Ogden, chemists of the Station.

Scope of the Vegetation Experiments of 1895.

In 1894 we studied the availability of nitrogen by vegetation experiments with maize, grown in pots of artificial soil, and supplied with relatively small quantities of nitrogen in various fertilizers.

The availability of the nitrogen in each case was measured by the quantity of nitrogen which the crop took from the fertilizer.

The artificial soil itself contained only traces of available nitrogen, but all the other elements of plant food were present in excess of the crop requirements.

If from 10 grams of nitrogen in form of nitrate, growing maize takes up 6 grams, while under exactly the same conditions from the same quantity of nitrogen in form of blood it takes up but 5 grams, the comparative availability of nitrate-nitrogen and blood-nitrogen is as 6 to 5 or as 100 to 83.3.

But a single crop cannot take all the nitrogen even of a nitrate from the soil, because, for one reason, the plant roots do not reach every particle of the soil. 73 per cent. is the largest proportion of the soil-nitrogen which a single crop has been able to secure in our experiments.

Still less can one crop take all the nitrogen from those animal or vegetable matters which decompose but slowly in the soil. In any case therefore more or less fertilizer-nitrogen fails to enter the crop.

In the case just given, 4 grams of nitrate nitrogen and 5 grams of blood nitrogen remain in the stubble, roots and soil, or pass into the air. The question at once arises, may not the 5 grams of blood nitrogen supply more nitrogen to the next crop than the 4 grams of nitrate nitrogen? If so, the results of a single year's cropping do not give the full value of blood-nitrogen as compared with nitrate nitrogen. The after-effects of both must be studied.

To do this, additional quantities of the same forms of nitrogen were mixed with the soil of the pots that had been used in the tests of 1894, and in 1895 they were made to bear a crop of oats followed by a crop of maize. From the quantities of nitrogen which these crops contained is calculated the availability of nitrogen as before.

Now if in the second year for every 6 grams of nitrogen taken by the crop from nitrate, 5½ grams are taken by the crop from blood, instead of 5 as in the first year, this extra ½ gram must have come from nitrogen applied the previous year, which had become available to the second year's crop, and the relative availability of the two forms of nitrogen is by so much nearer alike.

The artificial soil in our experiments was impregnated with a watery infusion of rich garden earth, but the conditions affecting microbic life may be quite different in a mixture of peat and ashes from those which obtain in natural soils, and it is likely that the relative availability of nitrogen in various vegetable and animal matters may differ in different kinds of soil, because the rapidity with which a nitrogenous organic substance decomposes and yields its nitrogen to plants largely depends on the character and activity of the microbes within the soil, which appear to be much influenced by texture, tillage and various conditions.

These considerations led us to make two parallel series of vegetation experiments in addition to those here described; one with soil taken from under old pasture turf which had not been broken up for thirteen years, nor top-dressed for ten years; the other with soil from a plot planted to corn for five years in succession without being dressed during that time with either manure or fertilizers.

Before publishing any results of these experiments with natural soils, we desire to repeat them with improvements suggested by recent experience and hope to make some report of them a year or two hence.

The Apparatus and Method.

These have been fully described in our Report for 1894, page 74, and in all points not specially noted in the following pages the same apparatus and method were employed in both years.

Vegetation Experiments in Artificial Soil. 1895.

A. Oat Crop.

These include those pots used in 1894, numbered from 5 to 21, 23 to 27, 102 to 117, 123 to 130, 135 to 137, 142 to 147. (See pages 83 to 86, Report of 1894.)

Soil and Fertilizers.—The pots, after the harvest in 1894, stood in a very dry cellar through the winter.

Just before planting time in the spring of 1895 the soil, consisting of coal ashes and peat with the roots of the crop of 1894, was poured out of each pot, such roots as had not decayed were pulverized and mixed with the soil, and after incorporating the fertilizers also with the soil, the whole was filled into the pot on the layer of gravel as described on page 78, Report of 1894.

Each pot received 5 grams of phosphate of potash, .25 gram of sodium chloride, .5 gram of sulphate of magnesia and 16 grams of carbonate of lime. The phosphate of potash contained 49.27 per cent. of potash and 35.82 per cent. of phosphoric acid, so that in 1895 each pot acquired 2.46 grams of potash and 1.79 grams of phosphoric acid. This, in addition to the amount of these ingredients left in the soil from the application made in 1894, could hardly have failed to provide both potash and phosphoric acid in excess of the crop requirements, for the largest crops harvested in 1895, from pots 12 and 13, took but .56 and .60 grams of phosphoric acid and 2.18 and 2.20 grams of potash respectively, from the soil.

The nitrogenous matters used in these experiments were the following:

Commercial Nitrate of Soda, slightly dried to facilitate grinding and weighing and containing 16.15 per cent. of nitrogen. This was a part of the same preparation which was used in 1894.

Dried Blood, bought from a dealer in fertilizers, which contained 11.4 per cent. nitrogen.

Castor Pomace, No. **4546,** a ground residue left after the removal of oil from the castor bean (*Ricinus*). The sample contained 4.98 per cent. of nitrogen.

Castor Pomace, No. **4545,** another sample, containing 4.78 per cent. of nitrogen.

Cotton Seed Meal. Bright yellow meal from the Connecticut market, containing 8.39 per cent. of nitrogen.

Dry Ground Fish, containing 9.51 per cent of nitrogen.

Ground Horn and Hoof from Chicago. Said to be made from horns and hoofs steamed under high pressure, which renders them brittle and easily reducible to a fine powder. The sample contained 15.59 per cent. of nitrogen and is part of the same preparation which was used in 1894.

"Bone Tankage," bought in New Haven, which contained 5.10 per cent. of nitrogen.

Linseed Meal, used extensively in this State as a cattle food but also, among tobacco growers, as a fertilizer. It contained 6.48 per cent. of nitrogen.

Raw Leather, **4581,** Steamed Leather, **4622,** Roasted Leather, **4623,** and Dissolved Leather, **4625,** have already been described on page 20 of the present Report.

All of the above materials were pulverized to pass circular holes $\frac{1}{50}$ inch in diameter.

The arrangement of the series of tests and the quantities of nitrogen used in them are shown in Table I, p. 105.

Before planting, the pots received the maximum quantity of water which was to be supplied to them during the test, together with the soil-infusion already spoken of.

Seed and Planting.—From a large quantity of seed oats, kernels were selected which weighed between .03 and .04 gram each. After they had sprouted, 10 kernels were planted in each pot.

To do this, 650 grams (one pound and seven ounces) of soil were removed from the pot, the kernels were placed at regular distances apart on the surface thus prepared and the removed soil was replaced, covering the seeds to a depth of about one inch. The ten kernels contained .0066 grams of nitrogen.

The planting was done on the 22d, 23d, and 24th of April.

On the 26th the oats began to come up.

Care during Growth.—After planting, the pots were removed to the summer vegetation house described in our last Report.

The water supply was kept between 80 and 60 per cent. of the water-holding capacity of the soil (see foot-note page 108) by the means fully described in the last Report, page 87.

Soon after the plants had developed a single leaf, a number of them became unhealthy, but only in those pots which received the larger quantities of organic nitrogenous matters. The soil in some of these pots acquired a musty smell.

Plants supplied with quickly available organic nitrogen, dried blood, for instance, were more sickly in appearance than those supplied with tankage or roasted leather. Plants in the pots having 2.4 grams of nitrate-nitrogen were perfectly healthy and dark green, while those having the same quantity of blood-nitrogen were yellow and sickly.

Plants having .8 gram of blood-nitrogen were thrifty in appearance, those having double that quantity had paler leaves, those with three times that quantity were very sickly.

The plants with the smaller quantities of nitrogen recovered and made good growth and all fruited well, those with the larger quantities remained backward and sickly and in some cases died.

It appeared quite certain that the rapid decay within the soil of such large quantities of nitrogenous matter had injured or poisoned the growing plants.

No such effect had been anticipated because, in 1894, the same *kinds and quantities* of nitrogen had been used with the same soil and pots, and the maize crop grown in them was healthy through the season. Oats thus appear to be more susceptible to injuries from such decaying matters than maize.

Harvesting.—On July 9th the crops were separately cut, air-dried, and weighed. Determinations of moisture and of nitrogen were made in the air-dry crops. These figures are presented and discussed on subsequent pages.

B. Maize Crop.

The pots from which the oat crops had been cut were afterward planted to maize, without the addition of any fertilizer and without disturbing the soil.

Three selected kernels of Early Canada Corn, each weighing between .40 and .44 gram, and containing in the aggregate about .0067 gram nitrogen, were soaked in water until the swelling radicles were perceptible under the seed coats but had not broken through, and planted in each pot.

Holes an inch and a half deep were made in the soil with a peg, in each hole a kernel was placed and the soil pressed together over it.

The planting was done on July 24th. On the 28th most of the plants were up. The crops grew satisfactorily and appeared healthy until the nitrogen supply in the soil gave out. In those pots where the oat crop had been a failure on account of the poisoning of the plants by the rapidly decomposing organic matter, the maize crop was thriftiest and largest, because in these the oat crop had taken off but little of the nitrogen.

The maize crops were harvested on October 3, 1895.

In Table I are given the weights of the separate crops and of the nitrogen in them. A discussion of the results follows.

The following explanations are referred to by small numerals in their appropriate places in the table:

2. .8 gram at planting time, .8 gram later.

3. .8 gram at planting time and same quantity at each of two intervals during growth.

4. The water in the pot was kept between 80 and 60 per cent. of the water-holding capacity of the soil.

5. The water in the pot was kept between 70 and 50 per cent. of the water-holding capacity of the soil.

6. The water in the pot was kept between 60 and 40 per cent. of the water-holding capacity of the soil.

7. The water in the pot was kept between 80 and 40 per cent. of the water-holding capacity of the soil.

TABLE I—VEGETATION EXPERIMENTS OF 1895. ARTIFICIAL SOIL.

Number of Pot.	Nitrogen supplied to the Oat Crop.		Oat Crop.				Maize Crop (following the Oat Crop without additional fertilizer).			
	In form of	Quantity of Nitrogen supplied. (Grams.)	Weight of air-dry Crop, exclusive of roots (grms).	Weight of Water-free Crop (grms).	Per cent. of Nitrogen in the air-dry Crop.	Total Nitrogen of Crop, exclusive of roots (grms).	Weight of air-dry Crop, exclusive of roots (grms).	Weight of Water-free Crop, exclusive of roots (grams).	Per cent. of Nitrogen in the air-dry Crop.	Total Nitrogen of Crop, exclusive of roots (grms).
5	Ground Horn and Hoof	.8	34.90	31.57	.87	.304	14.07	12.73	.57	.080
6	" " " "	1.6	64.60	57.65	.96	.620	25.13	22.87	.63	.158
7	" " " "	2.4	30.81	27.31	2.30	.709	60.14	54.25	.59	.355
8	" " " "	3.2	45.26	40.20	2.06	.932	76.18	68.90	.62	.472
9	Nitrate of Soda	.8	78.17	69.68	.83	.649	1.53	1.40	.58	.009
10	" "	1.6	87.94	76.86	1.40	1.231	10.29	9.24	.51	.053
11	" "	$.8+.8^2$	84.88	73.55	1.44	1.222	9.05	8.04	.49	.043
12	" "	2.4	69.60	60.48	2.18	1.517	67.88	61.04	.70	.475
13	" "	$.8+.8+.8^3$	88.27	77.09	2.00	1.765	64.96	58.35	.47	.305
14	Dried Blood	$.8^4$	52.64	47.39	.95	.500	4.46	4.10	.69	.031
15	" "	1.6^4	74.39	66.64	1.30	.967	11.76	10.99	.55	.065
16	" "	$.8^5$	67.71	60.10	.60	.406	5.03	4.57	.63	.032
17	" "	1.6^5	61.70	55.22	1.38	.852	19.56	17.89	.43	.084
18	" "	$.8^6$	61.34	53.55	.80	.491	2.73	2.47	.91	.025
19	" "	1.6^6	65.04	56.98	1.33	.865	12.40	11.36	.52	.064
20	" "	$.8^7$	65.48	58.36	.80	.524	3.99	3.67	.71	.028
21	" "	1.6^7	57.71	50.87	1.45	.837	23.76	21.70	.44	.105
23	" "	1.6	52.52	40.07	1.54	.809	17.84	16.35	.49	.087
24	" "	2.4	19.97	17.80	2.71	.541	99.83	90.65	.64	.639
25	" "	2.4	47.35	42.41	2.32	1.099	38.85	35.18	.49	.190
26	" "	3.2	10.11	8.87	2.98	.301	95.74	87.08	.87	.833
27	" "	3.2	5.66	5.06	3.03	.171	106.12	95.05	.92	.976
102	Castor Pomace No. 4545	.8	50.19	45.12	.94	.472	3.51	3.17	.68	.024
103	" " " "	1.6	48.44	43.52	1.71	.828	33.39	30.07	.42	.140
104	" " " "	2.4	50.83	45.49	2.37	1.205	47.29	42.96	.48	.227
105	" " " "	3.2	18.23	16.26	3.16	.576	130.94	118.43	.72	.943
106	Castor Pomace No. 4546	.8	58.85	53.01	.84	.494	2.83	2.58	.57	.016
107	" " " "	1.6	63.43	57.17	1.29	.818	23.20	21.54	.48	.113
108	" " " "	2.4	59.02	53.23	1.94	1.145	41.37	37.65	.49	.203
109	" " " "	3.2	.50	.45	----	----	144.34	130.17	.70	1.010
110	Cotton Seed Meal	.8	52.12	46.40	.88	.459	8.87	8.13	.61	.054
111	" " "	1.6	49.91	44.53	1.59	.794	28.34	25.89	.47	.133
112	" " "	2.4	42.35	37.76	2.34	.991	63.40	57.55	.38	.241
113	" " "	3.2	18.07	16.30	3.13	.566	117.53	106.91	.47	.552
114	Dry Fish	.8	56.63	51.10	.71	.402	3.62	3.34	.58	.021
115	" "	1.6	59.58	53.06	1.40	.834	14.18	13.02	.50	.071
116	" "	2.4	19.45	17.05	2.66	.517	79.91	72.61	.43	.344
117	" "	3.2	.24	.21	----	----	156.90	144.58	.63	.988
123	Tankage	.8	46.11	41.49	.73	.337	3.62	3.34	.63	.023
124	"	1.6	79.22	71.44	.70	.554	8.59	7.92	.62	.053
125	"	2.4	98.43	88.44	1.02	1.004	21.37	19.46	.46	.098
126	"	3.2	107.20	94.52	1.24	1.329	38.50	34.99	.45	.173
127	Linseed Meal	.8	47.02	42.17	.84	.395	7.49	6.83	.59	.044
128	" "	1.6	61.56	55.11	1.38	.850	29.78	27.17	.46	.137
129	" "	2.4	67.95	60.53	1.65	1.121	37.55	33.95	.45	.169
130	" "	3.2	6.20	5.53	2.84	.176	132.93	121.07	.57	.758
135	Raw Leather	.8	1.12	1.00	.82	.009	1.99	1.83	.57	.011
136	" "	1.6	1.10	.99	----	----	1.84	1.69	.59	.011
137	Dissolved Leather	.8	27.49	24.80	1.34	.368	5.61	5.09	.71	.040
142	Steamed Leather	.8	11.27	10.20	.59	.067	2.48	2.29	.55	.014
143	" "	1.6	17.84	16.00	.66	.118	3.09	2.83	.57	.018
144	" "	2.4	25.11	22.77	.68	.171	6.50	5.92	.53	.034
145	" "	3.2	31.93	28.80	.72	.230	6.77	6.13	.55	.037
146	Roasted Leather	.8	5.18	4.69	.90	.047	2.46	2.26	.63	.015
147	" "	1.6	12.15	10.91	.88	.107	5.23	4.76	.53	.028

TABLE II.—VEGETATION EXPERIMENTS OF 1894 AND 1895. ARTIFICIAL SOIL. ONE CROP (MAIZE) IN 1894, TWO CROPS (OATS FOLLOWED BY MAIZE) IN 1895.

AVAILABILITY OF NITROGEN FROM DIFFERENT RAW MATERIALS.

Number of Pot.	Source of the Fertilizer-Nitrogen.	Crop raised.	Year.	Quantity of Fertilizer-Nitrogen (grams).	Quantity of Crop-Nitrogen (grams).	Crop-Nitrogen expressed in per cent. of Fertilizer-Nitrogen.	Yearly average from Figures of preceding column.	Corrected yearly average excluding Figures in brackets.	Corrected average for the two years.
5	Horn and Hoof	Maize.	1894	.8	.307	38 4	38.9	38.9	**42.5**
6	" " "	"	"	1.6	.561	35.1			
7	" " "	"	"	2 4	1.015	42.3			
8	" " "	"	"	3.2	1.278	39.9			
5	" " "	Oats and Maize.	1895	8	.384	48.0	46.2	46.2	
6	" " "	" "	"	1.6	.778	48.6			
7	" " "	" "	"	2.4	1.064	44.3			
8	" " "	" "	"	3.2	1.404	43.9			
9	Nitrate of Soda	Maize.	1894	.8	.384	48 0	54.6	54.6	**68.4**
10	" "	"	"	1.6	.867	54.2			
11	" "	"	"	.8+.8	.797	49.8			
12	" "	"	"	2.4	1.376	57.3			
13	" "	"	"	.8+.8+.8	1.531	63.8			
9	" "	Oats and Maize.	1895	.8	.658	82.2	82.2	82.2	
10	" "	" "	"	1.6	1.284	80.2			
11	" "	" "	"	.8+.8	1.265	79.1			
12	" "	" "	"	2.4	1.992	83.0			
13	" "	" "	"	.8+.8+.8	2.070	86.3			
22	Dried Blood	Maize.	1894	.8	.334	[41.8]	40.1	39.8	**46.3**
23	" "	"	"	1.6	.604	37.7			
24	" "	"	"	2.4	.931	38.8			
25	" "	"	"	2.4	1.030	42.9			
26	" "	"	"	3.2	1.287	[40.2]			
27	" "	"	"	3.2	1.261	[39.4]			
22	" "	----	1895	----	---	----			
23	" "	Oats and Maize	"	1.6	.896	56.0	46.0	52.9	
24	" "	" "	"	2.4	1.180	49.1			
25	" "	" "	"	2.4	1.289	53.1			
26	" "	" "	"	3 2	1.134	[35.4]			
27	" "	" "	"	3.2	1.147	[35.9]			
102	Castor Pomace No. 4545	Maize.	1894	.8	.351	43 9	45.9	45.6	**53.1**
103	" " "	"	"	1.6	.680	42.5			
104	" " "	"	"	2.4	1.211	50.4			
105	" " "	"	"	3.2	1.499	[46.8]			
102	" " "	Oats and Maize.	1895	.8	.496	62.0	57.4	60.7	
103	" " "	" "	"	1.6	.968	60.5			
104	" " "	" "	"	2.4	1.432	59.7			
105	" " "	" "	"	3.2	1.519	[47.5]			
106	Castor Pomace No. 4546	Maize.	1894	.8	.315	39.4	36.6	36.8	**48.0**
107	" " "	"	"	1.6	.505	31.6			
108	" " "	"	"	2.4	.945	39.4			
109	" " "	"	"	3.2	1.148	[35.9]			
106	" " "	Oats and Maize.	1895	.8	.510	63.5	52.4	59.3	
107	" " "	" "	"	1.6	.931	58.2			
108	" " "	" "	"	2.4	1.348	56.2			
109	" " "	" "	"	3.2	1.010	[31.6]			

TABLE II.—VEGETATION EXPERIMENTS OF 1894 AND 1895. ARTIFICIAL SOIL. ONE CROP (MAIZE) IN 1894, TWO CROPS (OATS FOLLOWED BY MAIZE) IN 1895.—*Continued.*

AVAILABILITY OF NITROGEN FROM DIFFERENT RAW MATERIALS.

Number of Pot.	Source of the Fertilizer-Nitrogen.	Crop raised.	Year.	Quantity of Fertilizer-Nitrogen (grams).	Quantity of Crop-Nitrogen (grams).	Crop-Nitrogen expressed in per cent. of Fertilizer-Nitrogen.	Yearly average from Figures of preceding column.	Corrected yearly average excluding Figures in brackets.	Corrected average for the two years.
110	Cotton Seed Meal	Maize.	1894	.8	.330	41.3	40.3	41.6	**49.7**
111	" " "	"	"	1.6	.589	36.8			
112	" " "	"	"	2.4	1.126	46.9			
113	" " "	"	"	3.2	1.157	[36.1]			
110	" " "	Oats and Maize.	1895	.8	.513	64.1	52.1	57.8	
111	" " "	" "	"	1.6	.927	57.9			
112	" " "	" "	"	2.4	1.232	51.3			
113	" " "	" "	"	3.2	1.118	[35.0]			
114	Dry Fish	Maize.	1894	.8	.297	37.1	35.5	35.2	**45.0**
115	" "	"	"	1.6	.531	33.2			
116	" "	"	"	2.4	.929	[38.7]			
117	" "	"	"	3.2	1.062	[33.2]			
114	" "	Oats and Maize.	1895	.8	.423	52.9	44.0	54.8	
115	" "	" "	"	1.6	.905	56.6			
116	" "	" "	"	2.4	.861	[35.8]			
117	" "	" "	"	3.2	.988	[30.9]			
123	Tankage	Maize.	1894	.8	.282	35.3	37.2	37.2	**40.5**
124	"	"	"	1.6	.590	36.9			
125	"	"	"	2.4	1.024	42.7			
126	"	"	"	3.2	1.077	33.7			
123	"	Oats and Maize.	1895	.8	.360	45.0	43.9	43.9	
124	"	" "	"	1.6	.607	37.9			
125	"	" "	"	2.4	1.102	45.9			
126	"	" "	"	3.2	1.502	46.9			
127	Linseed Meal	Maize.	1894	.8	.330	41.2	35.2	37.5	**47.1**
128	" "	"	"	1.6	.635	39.7			
129	" "	"	"	2.4	.755	31.5			
130	" "	"	"	3.2	.909	[28.4]			
127	" "	Oats and Maize.	1895	.8	.439	54.9	49.9	56.8	
128	" "	" "	"	1.6	.987	61.7			
129	" "	" "	"	2.4	1.290	53.8			
130	" "	" "	"	3.2	.934	[29.9]			
135	Raw Leather	Maize.	1894	.8	.014	1.8	1.1	1.1	**1.4**
136	" "	"	"	1.6	.009	.5			
135	" "	Oats and Maize.	1895	.8	.020	2.5	1.6	1.6	
136	" "	" "	"	1.6	.011	.7			
137	Dissolved Leather	Maize.	1894	.8	.308	38.5	38.5	38.5	**44.7**
137	" "	Oats and Maize	1895	.8	.408	51.0	51.0	51.0	
142	Steamed Leather	Maize.	1894	.8	.047	5.9	4.1	4.1	**6.5**
143	" "	"	"	1.6	.053	3.3			
144	" "	"	"	2.4	.088	3.7			
145	" "	"	"	3.2	.116	3.6			
142	" "	Oats and Maize.	1895	.8	.081	10.1	8.8	8.8	
143	" "	" "	"	1.6	.136	8.5			
144	" "	" "	"	2.4	.205	8.5			
145	" "	" "	"	3.2	.267	8.3			
146	Roasted Leather	Maize.	1894	.8	.040	5.0	4.7	4.7	**6.5**
147	" "	"	"	1.6	.071	4.4			
146	" "	Oats and Maize.	1895	.8	.062	7.8	8.2	8.2	
147	" "	" "	"	1.6	.135	8.5			

DETERMINATION OF NITROGEN IN THE OAT CROPS.

Presence of Nitrates.

Many of the crops contained nitrates, and some of them very considerable quantities. The Jodlbauer-Kjeldahl method was therefore used in all cases for determining nitrogen.

Direct determinations of nitrate-nitrogen in some of the air-dry crops gave the subjoined results :

Pot No.		In air-dry crops Nitrogen as Nitrates.	
5	Not more than	.05	per cent.
6	" " "	.05	"
7		.56	"
8		.44	"
13		.46	"
24		1.00	"
25		.50	"
104		.65	"
129	Not more than	.12	"

It is well known that when nitrates are abundant in the soil they often enter plants more rapidly than they can be assimilated, and sometimes accumulate in large amount. Striking instances are to be found in Annual Report of this Station for 1888, p. 62, and especially in Kansas Exp. St. Bulletin No. 49.

The nitrate nitrogen, no less than the organic nitrogen, found in the crops under notice, we must assume to have been furnished by the fertilizers that were used and therefore should be credited to these fertilizers.*

DISCUSSION OF TABLES I AND II.

The Water Supply.

Four pairs of pots, fertilized with Dried Blood, were watered differently for the purpose of observing the most suitable proportions of water to provide in these experiments.

In pots 14 and 15, Table I, the water in the soil was maintained between 80 and 60 per cent. of the water-holding capacity of the soil;† in pots 16 and 17 between 70 and 50 per cent.; in pots 18 and 19 between 60 and 40 per cent., and in pots 20 and 21 betweeen 80 and 40 per cent.

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* Various evidence has indeed been adduced of late years, going to show that fungoid vegetation or microbes are able to assimilate free atmospheric nitrogen, but our knowledge of the extent and conditions of this alleged assimilation is as yet too uncertain to warrant introducing this possibility into our discussion.

† The quantity of water which the perfectly saturated soil in a vegetation pot holds, measures the "water-holding capacity" of this soil. In these experiments this quantity of water was 3892 grams or 8.57 pounds. 80 per cent. of this is 3113 grams, or 110 ounces.

In other pots, the water supply was maintained between 80 and 60 per cent., but was to be changed at any time, if the growth in either series of pots 14 to 19, appeared better. The results show that in 1895, as in 1894, the largest assimilation of nitrogen was in pots where the soil had a water content of 80 to 60 per cent., the amount used in all the other series.

Availability of the Fertilizer-Nitrogen.

Our own experiments illustrate what has been abundantly demonstrated by others, that the weight of *dry matter* harvested (water-free crop) is no certain measure of the nitrogen assimilated by the crop.

The different crops vary greatly in the per cent. of nitrogen which they contain, or otherwise expressed, an ounce of nitrogen taken by the crop in one case causes a much larger production of dry matter than in another, particularly if other factors which control growth are not alike.

To illustrate: Pots 5, 6, 7 and 8, Table I, page 105, received .8, 1.6, 2.4 and 3.2 grams of nitrogen* respectively, in form of horn and hoof. As none of these quantities was excessive, and the other fertilizer ingredients were present in abundance, it might be expected that the dry matter harvested from the two crops together, would show an increase somewhat corresponding to the increase of nitrogen. But they do not.

The dry matter of the crops is 31.7, 57.8, 27.7 and 40.7.† From this it appears that 0.8 gram of fertilizer nitrogen produced more dry matter than 2.4 grams, and 1.6 grams of fertilizer nitrogen produced more than 3.2 grams. These figures *in themselves* would be puzzling and worthless.

But, the determination of the nitrogen actually taken up by the crops from the fertilizer, makes the results intelligible. The quantities are .384, .778, 1.064 and 1.404 respectively,‡ being a regular increase of nitrogen assimilated, corresponding to the increase in nitrogen supplied. This increase is not necessarily proportional to the increase of nitrogen supplied, for as the quantity of nitrogen in the fertilizer approaches the greatest amount which the plants can utilize, the increase of crop-nitrogen with each successive increase of fertilizer-nitrogen must grow less and less, till there comes a point where increase of fertilizer-nitrogen gives no increase of crop-nitrogen.

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* The Fertilizer-nitrogen ratios are 10, 20, 30, 40.
† The Dry Crop ratios are 10, 18, 9, 13.
‡ The Crop-nitrogen ratios are 10, 20, 28, 36½.

In 1894 there was a much closer correspondence among ratios of the same order, viz:

In 1894 the Fertilizer-nitrogen ratios were, 10, 20, 30, 40
" " Dry Crop " 10, 16, 18, 19
" " Crop-nitrogen " 10, 18, 33, 41.

In considering the relative availability of the different forms of nitrogen, as shown by these tests, we shall notice, therefore, only the quantities of nitrogen which the crops took from the fertilizer supplied to them.

It is seen that the unequal development and unhealthy condition of the oat plants in the pots having the larger doses of quickly decomposing organic fertilizers, renders any conclusions from the oat crop alone unsatisfactory.

The maize crop of 1895 was also very irregular, but in all cases where the oat crop failed, or was small, the following maize gave a large yield: Nos. 26, 27, 105, 109, 113, 117 and 130. It is likewise to be remarked that the large oat crops, in every instance, were followed by small (and usually the largest by the smallest) maize crops. This fact indicates that the final maize crops probably almost or completely exhausted the nitrogen available at the termination of the experiment. Therefore, a comparison of the fertilizer-nitrogen supplied in the two applications of 1894 and 1895 with the crop-nitrogen obtained in the three harvests of those years, will probably furnish a trustworthy estimate of both the absolute and relative availability of the fertilizer-nitrogen.

Table II gives a complete view of all the results of 1895 and of 1894, which are fairly comparable. The last columns give the averages based upon these data.

A considerable number of experiments made with Dried Blood as a source of nitrogen, to study the effects of increased or diminished supply of water, potash or phosphoric acid, are excluded from Table II, because they are not strictly comparable with the others in a discussion of the availability of different forms of nitrogen. Most of them, however, gave the same result as that stated in Table II for the six pots there included.

Certain exceptional results, which in Table II are enclosed in brackets, are excluded from the "corrected averages."

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‡ See foot-note on p. 109.

The crop-nitrogen in both pots 26 and 27, which received 3.2 grams of nitrogen in Dried Blood, was less than in pots 24 and 25, which received only three-fourths as much nitrogen. This is explained by the fact already mentioned on page 103, viz: that the oat crop was seriously damaged by the rapid decay of the nitrogenous matter within the soil. A portion of the nitrogen of the decaying matter was possibly set free or made inaccessible to the following maize crop. These two results should, therefore, be excluded from the final average.

Since the crop-nitrogen expressed in per cent. of the fertilizer-nitrogen (which in this paper we shall call the "per cent. availability" or "per cent." simply), was much larger in 1895 than in 1894, we must exclude the corresponding experiments in 1894 (pots 28 and 27) from a general average of the results of both years, in order to give the results in 1895 and 1894 their true relative value in the average.

The same remarks apply to the crops in pots 105, Castor Pomace No. **4545** ; 113, Cotton Seed Meal; 116, Dry Fish; and 130, Linseed Meal.

While the crop-nitrogen in pot 117 is larger than in 116 or 115, it bears no just proportion to the increase of fertilizer-nitrogen, the oat crop in this pot being almost a total failure.

The results in the instances cited have been accordingly excluded from the last two columns of averages.

In the column headed "Crop-nitrogen expressed in per cent. of fertilizer-nitrogen" (Table II), we have a set of figures obtained, in the first instance (pot 5), by the arithmetical proportion .8 : 100 : : .307 : 38.4, which signifies that of 100 parts of fertilizer-nitrogen, in this case supplied by horn and hoof, 38.4 parts have been taken into the crop which was harvested from that pot.

The "crop" here, be it remembered, does not include roots.

The column headed, "Yearly average from figures of preceding column," gives the average of *all* the figures from the preceding column, *including those inclosed in brackets.*

For reasons just mentioned, the figures in brackets are excluded from the final averages, which are stated in the last two columns. It will be noticed that the greatest difference between the mean of the "yearly averages" and that of the "corrected yearly averages" occurs in case of Dry Fish, and there amounts to 5.3 per cent. The other differences are for Linseed Meal, 4.6 per cent. ;

Cotton Seed Meal and Castor Pomace No. **4546,** each 3.5 per cent.; Dried Blood, 3.3 per cent.; and Castor Pomace No. **4545,** 1.5 per cent.

It is thus plain that the disaster to the Oat Crop and the consequent irregularities in the growth of the following maize crop have very nearly compensated each other in respect to the total acquisition of fertilizer-nitrogen.

In the following statements the various fertilizers are arranged in the order of their efficiency (expressed in round numbers) as sources of nitrogen to the maize and oat crops in our experiments of 1894 and 1895.

	Per cent. of available Nitrogen reckoned on total Nitrogen.	Per cent. of available Nitrogen reckoned on the available Nitrogen of Nitrate of Soda.
Nitrate of Soda	68	100
Castor Pomace No. **4545**	53	77
Average of Castor Pomace Nos. **4545** and **4546**	50.5	74
Cotton Seed Meal	49.5	72
Castor Pomace No. **4546**	48	70
Linseed Meal	47	69
Dried Blood	46.5	68
Dry Fish	45	66
Dissolved Leather	44.5	64
Horn and Hoof	42.5	62
Tankage	40.5	59
Steamed Leather	6.5	9
Roasted Leather	6.5	9
Raw Leather	1.5	2

Since in all cases the roots of the plants remained in the soil and we have no ready means of learning how much nitrogen the roots contain, our experiments show only what the "crops," i. e., the cropped stems, leaves and fruit, have taken up and not what the vegetation as a whole has made use of.

As is well known, the roots of many plants make at first a relatively greater growth than the tops, and in the flowering and fruiting processes there is an extensive and rapid transfer of vegetable substance from the roots to the tops.*

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* The quantity of roots in per cent. of the entire plant in the dry state, was found by Schubart to be as follows:

Winter wheat, last of April	40	per cent.
" " May	22	"
Peas, four weeks after sowing	44	"
" at time of blossom	24	"

—How Crops Grow, p. 264.

This is one reason why the increase of crop-nitrogen does not keep regular pace with the increase of fertilizer-nitrogen. That the increase of crop-nitrogen is not always parallel with that of dry substance, probably depends in part on the fact that in different stages, or under different conditions of growth, the proportion of nitrogen in the roots is now greater and now smaller than in the tops.

Looking now at the item Nitrate of Soda, we find that of 100 parts of its nitrogen applied as a fertilizer, 68½ parts were recovered in the three crops. There remains of course in the soil a residue of nitrogen in the form of maize roots, but since the nitrogen of all the last maize crops was less than one-sixth that of the oat crops, we may infer that the available residue is not large.

The strikingly greater availability of nitrate nitrogen in 1895, 82 per cent., over that found in 1894, 55 per cent., is evidently in part due to the fact that while the first maize crops practically had no source of nitrogen except the nitrate, each of the second year's crops had, besides the nitrate applied directly to the oats, some residue of the first year's supply, perhaps unused nitrate and certainly nitrogen of the roots of the first year's crop, which became available the second year.

Another reason of the larger availability shown in the second year lies in the fact that the soil then bore two crops and was more than twice as long in possession of active vegetation. The maize crop of 1894 occupied the pots 68 days. The oat crop of 1895 was 75 days and the maize crop of that year 68 days (on the average) between seeding and harvest.

We observe, in Table II, that, in general, the availability of nitrate nitrogen increased somewhat, as the quantity used was greater. In 1894 the increase was large, rising from 48 to 64. In 1895 it was slight, rising from 74 to 79. In both years, however, pot 11 yielded less than pot 10, apparently because the small applications, which were the same in total amount, were better utilized, when applied at once, than when given in two doses. In pot 10 the 1.6 gram of nitrogen would seem to have given the young plants a better start, developed a stronger root system and enabled the plants to forage more effectually.

On the other hand, 13 surpassed 12 both years, three applications of 0.8 gram each, giving slightly greater yield, than one of 2.4 grams.

The oat crops supplied with nitrate had a healthy appearance throughout the season. At harvest the nitrate oat crops averaged from 42 to 48 inches in height, each pot bore from 23 to 38 stalks, an average of 30, of which 26 were headed.

Castor Pomace No. **4545** stands second in order of nitrogen-availability. Of 100 parts of nitrogen, supplied in this form, the crops in two years assimilated 53 parts.

Crops 102, 103, 104 while evidently injured at the outset as already described, had a fair color and growth on June 19, while crop 105, which as early as May 9th was inferior to the others, on June 19th was stunted and yellow and had but three plants (bearing 17 stalks) remaining. These were green and still growing at harvest. Crop 105 is excluded from the average.

The other crops had 14, 20 and 30 stalks, bearing 14, 17 and 17 heads respectively, and were from 45 to 48 inches high.

Next in order of nitrogen-availability stands Cotton Seed Meal, 49.5.

While all the crops in this series were yellow in color at first, 110 recovered, made good growth and had a dark green color by June 5. 111 and 112 were longer in recovering, but made fair growth later, while 113 was stunted and pale in color through the season, and has been excluded from the average. The number of stalks in the several crops was 15, 32, 27, 14; the number of heads, 15, 20, 15, 3. Crop 110, which had least nitrogen, was the tallest, 47 inches; the others were 40, 38 and 27 inches.

It is seen that for 1895 the nitrogen-availability was greatest in crop 110, and diminishes regularly and rapidly in the three other crops. We believe that this was caused by damage to the oat crops, which was not, as in other cases, fully compensated by the increase in following maize crop. If this be true, the relative availability of the nitrogen of Cotton Seed Meal is somewhat greater than shown by our results.

Castor Pomace, No. **4546**, has an availability of 48. Crop 106 had a healthy appearance and growth through the season. Crops 107 and 108, which were sickly at first, recovered early in June and made fair growth. Crop 109 was unthrifty and stunted from the outset and at last died completely. It is excluded from the average.

The other crops bore 13, 18 and 25 stalks respectively, with 13, 15 and 19 heads. The heights were 42, 45 and 36 inches respectively.

The experiments of the two years indicate a decided superiority of the Castor Pomace No. **4545.**

Whether the inferiority of the Castor Pomace No. **4546** is due to presence of more oil or to greater heat used in preparation whereby the albuminoids have been more thoroughly coagulated or more hardened by drying, is not at present known.

Scarcely less than the availability of this kind of Castor Pomace is that of Linseed Meal, 47, and Dried Blood, 46.5.

The oat crops in both series were badly injured at the start; crop 130 which received Linseed Meal and crops 26 and 27 which received Dried Blood remained stunted and sickly through the season, and were excluded from the average. The oat crops raised with Dried Blood had 21, 16, 26, 18 and 10 stalks of 45, 35, 44, 24 and 22 inches in length, and with 19, 7, 14, 8 and 3 heads respectively; those raised with Linseed Meal had 15, 29, 33 and 9 stalks of 50, 48, 42 and 26 inches length, and with 14, 21, 23 and 3 heads.

Dried Fish had an availability of 45. Only two crops, 114 and 115, are considered in making this average, because of the damage sustained by the oat crops in the other pots early in the season.

Dissolved Leather, Horn and Hoof, and Tankage follow, with availabilities of 44.5, 42.5 and 40.5 respectively.

The method of preparing the Dissolved Leather has been already described on page 20 of this report.

The Leather was heated with about one and a half times its weight of oil of vitriol in a manner that probably has not been attempted on a commercial scale. Crops 137 demonstrated that the nitrogen of Leather can be made as available to plants as is that of Dry Fish, Blood or Tankage.

It will be noticed that in these experiments Tankage has shown a lower availability than any other of the approved forms of fertilizer-nitrogen, and that Fish and Horn and Hoof have a lower availability than Blood, or the vegetable forms of organic nitrogen. Their solubility in pepsin-solution as observed in last year's Annual Report follows the same order as their nitrogen-availability here recorded.

Steamed or Roasted Leather is a slowly acting fertilizer, but in these experiments, its nitrogen was nearly four to five times more available than that of Raw Leather, and was twice as available the second year as the first, a result doubtless due to the multiplication in the soil of the microbes that are essential to decay, whereby the nitrogen of leather is converted into forms that can feed vegetation.

In our last Report, 1894, p. 97, it was stated that "Extended discussion of these results is reserved till the tests have been repeated under varying conditions."

The experiments of 1895 just described do not by any means conclude the subject, but are rather a report of progress and have been purposely described so as to present fully their defects. The investigation will be continued during the coming season.

The indications of the present year's tests agree with those of 1894 in these respects, that the nitrogen of Castor Pomace No. 4545 has shown the highest availability of any form of organic nitrogen, that Fish, Horn and Hoof, and Tankage have manifested the lowest availability, Leather excepted. While Cotton Seed Meal, Castor Pomace No. 4546, Linseed Meal and Dried Blood stand intermediate, with no very striking difference between the four.

In conclusion we refer to the tabulated statements on page 112, as giving the results of our vegetation experiments during 1894 and 1895, on the actual and relative availability of Fertilizer-Nitrogen.

THE COMPARATIVE EFFECTS OF MURIATE AND SULPHATE OF POTASH ON THE POTATO CROP.

By E. H. Jenkins.

The muriate is at present the cheapest source of potash, of which it contains 50 per cent., and costs at retail about $42.50 per ton, while the high grade sulphate, having also 50 per cent. of potash, costs from $50 to $55 per ton. The double sulphate of potash and magnesia, commonly called "low grade sulphate," selling for about $30 per ton, contains from 26 to 28 per cent. of potash, and is quite as expensive a source of potash as the high grade sulphate.

The muriate is, therefore, chiefly used, unless for special reasons.

German field experiments have shown, in many instances, that muriate of potash, on potato land, especially when applied in the spring, more or less increases the proportion of water and correspondingly diminishes the per cent. of starch and other solids in the crop of tubers. These effects are most marked when kainit (advertised as a sulphate but containing a large amount of muriates) is used as the source of potash.

Watery potatoes are well known to be inferior for cooking as well as for feeding purposes and, accordingly, it is often advised to apply sulphate of potash and to avoid using either the muriate of potash or kainit upon potato fields, although the yield of tubers is generally increased by the muriate of potash more than by the sulphate.

The only experiments made in this country bearing on this subject, report of which has come under our observation, are those made at the New Jersey Station.

The soils on which the tests were made were first, a heavy and gravelly clay loam, with clay subsoil, not specially adapted to potatoes; second, a fertile sandy loam, with open subsoil, well suited to potatoes; and third, a light sandy loam, of medium fertility. Each plot received 200 lbs. nitrate of soda, 320 lbs. dissolved bone black and 160 lbs. of either muriate or sulphate of potash or else 640 lbs. of kainit.

The results of the three series of tests were concordant and showed that the yield of tubers from muriate was four to six per cent. greater than from sulphate; that the tubers raised without fertilizer had the highest per cent. of dry matter; and that the average decrease of dry matter and of starch in the tubers, attributable to the different form of potash, were as follows:

	Decrease, per cent.	
	Dry Matter.	Starch.
Sulphate of potash	3.1	4.3
Muriate of potash	7.1	7.7
Kainit	11.8	12.7

The potatoes raised with sulphate of potash, while not so large, were more uniform in size and had a smoother skin than the others. Samples of the three sorts were cooked alike and persons unacquainted with their origin, selected without hesitation, as the best, those grown with sulphate.

Four similar field-tests made under the supervision of this Station, are described in the following pages.

Experiment on Land of Mr. G. F. Platt, Milford, Ct.

The field is situated on the second terrace of the bank of a small stream, and the soil is light and gravelly. The trial was made in 1888. Over the whole field had been broadcast, at the rate of 1000 lbs. per acre, a home mixture containing 4.8 per cent. of nitrogen, 10.5 per cent. of phosphoric acid and 8.5 per cent. of potash in form of mixed sulphate and muriate of potash (163 lbs. of high grade sulphate of potash and 120 lbs. of muriate per ton of fertilizer).

There were sown in addition, on one measured acre, 200 lbs. of muriate of potash, and on another acre 200 lbs. of high grade sulphate of potash (51 per cent. actual potash). "Beauty of Hebron" potatoes, medium size tubers, were planted whole about the 15th of May. All of the acre plots had precisely the same cultivation and care. During growth no striking differences were noted, except that in the last week of July the tops on the muriate plot looked a little yellow, as if more mature.

On September 9th the potatoes were dug and weighed by us and samples drawn for analysis.

The crop from every fifth row, making six rows on each acre, was weighed, and from these the acre-yield was calculated. The potatoes were almost entirely free from rot.

Following are the yields per acre:

		Yield in bushels.	Per cent. of Starch in potatoes.	Pounds of Starch per acre.	Pounds of Starch per bushel of potatoes.
A	Home-mixture and muriate of potash	163⅔	17.0	1675	10.2
B	Home-mixture and sulphate of potash	178	17.9	1909	10.7
C	Home-mixture alone	186½	17.6	1971	10.6
D	No fertilizer	100¾	18.1	1096	10.9

On D, without fertilizer, the potatoes were very inferior, not more than one-half of them marketable. If we call the yield of potatoes and of starch on the unfertilized plot 100 per cent. the other crops will stand as follows:

		Per cent. yield.	Starch.
A	Home-mixture and muriate	162	153
B	Home-mixture and sulphate	176	174
C	Home-mixture alone	185	180
D	No fertilizer	100	100

It appears that the addition of potash salts depressed the yield slightly, the sulphate less than the muriate, and that the yield of starch to the bushel of potatoes was largest with no fertilizer, next with sulphate of potash and with home-mixture, and least with muriate.

Evidently Mr. Platt's home-mixture contained all the potash that the crop required in this season and on this land.

ANALYSES OF POTATOES RAISED BY MR. THERON E. PLATT, OF NEWTOWN, CT., IN 1887.

Two samples of White Flower potatoes were sent to this Station by Mr. Platt for examination, with the statement that the one was raised with help of 200 lbs. of sulphate of potash per acre, the other represented the crop grown with 200 lbs. of muriate, the other fertilizers being alike.

Their specific gravities and per cent. composition were as follows:

	Potatoes raised with Sulphate of Potash.	Potatoes raised with Muriate of Potash.
Specific gravity	1.091	1.082
Water	76.77	77.39
Starch	18.38	17.99
Ash	.93	.98
Total nitrogen	.38	.35
Starch in the dry matter	79.10	79.60

In this case the potatoes raised with muriate contained .6 per cent. more water and .39 per cent. less starch than those raised with sulphate, but the DRY MATTER of the latter contained half a per cent. less of starch.

EXPERIMENT CONDUCTED BY MR. W. H. OLCOTT, SOUTH MANCHESTER. 1895.

In connection with observations on the prevention of potato scab, described elsewhere in this Report, Mr. Olcott tested the comparative effects of sulphate and muriate of potash.

The soil of the experiment field is a very light sandy loam.

The field for ten years previous to 1894 had not been fertilized at all. In 1894 potatoes were grown with about the same kind of fertilizers as in 1895.

In 1895 the land received per acre 1500 pounds of a home-mixture, described on page 65 of this Report.

One of the plots had mixture **4876**, containing 120 pounds of potash as muriate, the other had mixture **4877**, containing the same quantity of potash as sulphate.

Samples of the crops raised with the two fertilizers contained per cent.

	Potatoes raised with	
	Muriate of potash.	Sulphate of potash.
Water	78.29	77.83
Dry matter	21.71	22.17
Starch	14.14	14.34
Starch in the dry matter	65.10	64.70

The potatoes grown with muriate in this test contained nearly half a per cent. more water and correspondingly less starch than those raised with sulphate. The dry matter of the potatoes raised with muriate, however, contained more starch than those grown with sulphate by about .4 per cent.

EXPERIMENT CONDUCTED BY THE STATION ON LAND OF J. H. WEBB, HAMDEN, 1895.

The soil was a light sandy loam, in good condition as regards fertility.

The whole piece received a light dressing of stable manure, which was plowed in. It was then divided into four plots, each 410 by 27 feet and containing a quarter of an acre. One-half of each plot was dressed with oyster shell lime at the rate of 250 pounds per acre.

Each plot received in the drill 120 pounds of dissolved bone black (containing 20 pounds of phosphoric acid) and 90 pounds of dried blood (containing 12 pounds of nitrogen).

Plot A received no potash. Plot B received 63 pounds of potash as muriate. Plot C the same quantity of potash in form of double sulphate of potash and magnesia, and plot D the same quantity of potash as high grade sulphate.

The field was planted to potatoes and cultivated and harvested in the usual way.

The yields were as follows :

Potato Experiment on Land of J. H. Webb, Season of 1895.

Plot.	Potash salt used.	Yield per ¼ acre in pounds. Salable.	Small.	Equivalent bushels per acre.	Water.	Starch in fresh Potatoes.	Starch in dry matter of potatoes.
A	No potash salt,	2610	432	202	79.55	15.47	75.72
A_1	Same as A, with lime,	3276	576	256	79.65	15.48	76.07
B	Muriate of Potash,	2646	666	221	79.25	15.63	75.41
B_1	Same as B, with lime,	2574	792	224	79.24	15.68	75.59
C	Double sulphate of potash	2808	369	212	79.42	15.63	75.93
C_1	Same as C, with lime,	2592	342	196	78.86	16.07	76.03
D	High grade sulphate of Potash,	3456	432	259	78.72	15.90	74.74
D_1	Same as D, with lime,	2772	486	217	78.42	16.55	76.69

The results show that the soil was not strikingly deficient in potash. The muriate increased the yield some 10 per cent., the high grade sulphate 29 per cent., the double sulphate 5 per cent., assuming that the plots at the outset were alike in crop-producing capacity.

Lime in connection with the potash salts in two out of the three tests reduced the yield.

The difference in composition of the tubers from the several plots was small.

The largest difference in water-content was 1.2 per cent. and in starch 1.1 per cent., and the greatest difference in starch content of the dry matter was 1.95 per cent.

Contrary to general experience, the potatoes grown without potash fertilizers had nearly as much water and less starch than any others.

Averaging the results of the limed and unlimed plots, the potatoes grown on muriate of potash contained 15.65 per cent. of starch, those grown with sulphate of potash 16.22 per cent. and those grown with double sulphate 15.85 per cent.

The percentages of starch in the dry-matter of the potato were 75.50, 75.70, and 75.98 respectively.

The per cents. of small and unsalable potatoes in the crops from the several plots were as follows:

No potash salt in fertilizer	14.6	per cent.
Muriate of potash used	21.8	"
High grade sulphate used	13.0	"
Double sulphate of potash	11.6	"

EXPERIMENT CONDUCTED BY T. J. STROUD, OF SHAKER STATION, CONN.

This experiment was carried out by Mr. Stroud in coöperation with the German Kali Works, of New York. A representative of the Station was present at the harvest, and samples drawn at that time were examined in the Station laboratory.

The aim of the experiment was to learn how muriate of potash compares with sulphate of potash in its effects on both the yield and starch-content of the crop, and what is the effect of an application of lime with these salts of potash.

Incidentally Mr. Stroud also made a comparative test of wood ashes, Florida soft phosphate and a home-mixed "complete" fertilizer.

The field was an old pasture which had been top-dressed from time to time but had not been under the plow for many years.

The variety of potatoes was the New Queen.

The fertilizers used and the arrangement of the plots is shown in the table on page 124.

Mr. Stroud's notes regarding the care of the crop and the weather are as follows:

Culture.—The field was plowed on April 10th to 12th, harrowed twice with Cutaway and Acme harrows on May 3d and 4th and immediately plowed and harrowed a second time.

After marking out the plots of one-fifth acre each, the fertilizer was sowed on May 14th with the Spangler broadcast fertilizer distributor.

The next day the whole piece was planted with an Aspinwall planter.

On the 23d the lime was applied to certain plots and harrowed in.

On the 30th the piece was harrowed with the Thomas smoothing harrow.

June 3d, Breed's weeder was run over the plots. The next day the potato plants first appeared, having been kept back by the cold, dry weather.

On June 7th and again on the 13th, Breed's weeder was run over the plots, and on the 22d the Planet Jr. cultivator.

On June 25th, 29th and July 5th, Paris Green was put on with the machine sprinkler, and on June 31st it was applied with the Leggett gun.

June 27th. Used the Prout hoe on the plots.

July 28th and August 8th. Bordeaux mixture was put on with the machine sprinkler.

The crop was harvested between the 17th and the 24th of September.

Weather.—The week from May 3d to 10th was dry and very hot but on the 14th and 17th there were frosts, and the weather continued cold and dry till the 24th. There were showers on that day and the next and heavy rain on the 26th.

From the 28th to June 1st the air temperature rose to 90° each day. Heavy rain fell for five hours on June 4th. There was rain on the 5th, 24th, 27th and 28th of June and on the 4th, 6th, 10th, 13th, 16th, 27th and 30th of July. The weather from then on was generally dry, with some very warm weather in the middle of September.

In July Mr. Stroud made a careful examination of the plots to note the comparative effects of blight and marked the general appearance of the vines on a scale of 100. His record is as follows:

Appearance of the Crop in July.

Plot.	Fertilizers.	Relative thriftiness of Vines. Perfect = 100.	
Plot 1.	No fertilizer	40	Tops fairly green, somewhat blighted.
" 1a.	Lime	45	Tops a little more blighted.
" 2.	Nitrate and Bone Black	60	" a little blighted.
" 2a.	Same as 2, with lime	55	" a little more blighted.
" 3.	Nitrate, Bone Black and muriate	80	" not much blighted.
" 3a.	Same as 3, with lime	90	" " "
" 4.	Nitrate, Bone Black and double quantity muriate	95	" " "
" 4a.	Same as 4, with lime	100	" only a trifle blighted.
" 5.	Nitrate, Bone Black and sulphate	90	" turning ripe a trifle.
" 5a.	Same as 5, with lime	80	" " a little more.
" 6.	Florida soft phosphate	55	" blighted a little.
" 6b.	Florida soft phosphate and nitrate	60	" " "
" 7.	Florida soft phosphate and muriate	65	" not much blighted.
" 7b.	Same as 7, with nitrate	75	" blighted a little.
" 8.	Home mixture	85	No blight.
" 9.	Nitrate and wood ashes	70	" "

The vines on plot 8, where organic nitrogen was used in the fertilizer, were green for nearly a month longer than those on plots which were dressed with nitrate of soda.

The potatoes were carefully dug by hand, sorted on the field, photographed and then weighed on a platform scale, the crop from each plot by itself, as they were hauled from the field.

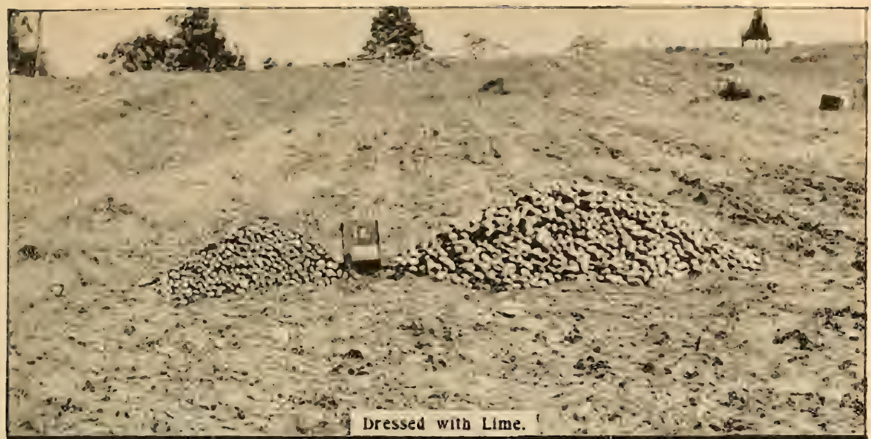
Photographs of the potatoes from some of the plots are reproduced in the accompanying plates.

The salable potatoes from each plot were sampled by the Station representative and water and starch were determined by Mr. Winton in each lot.

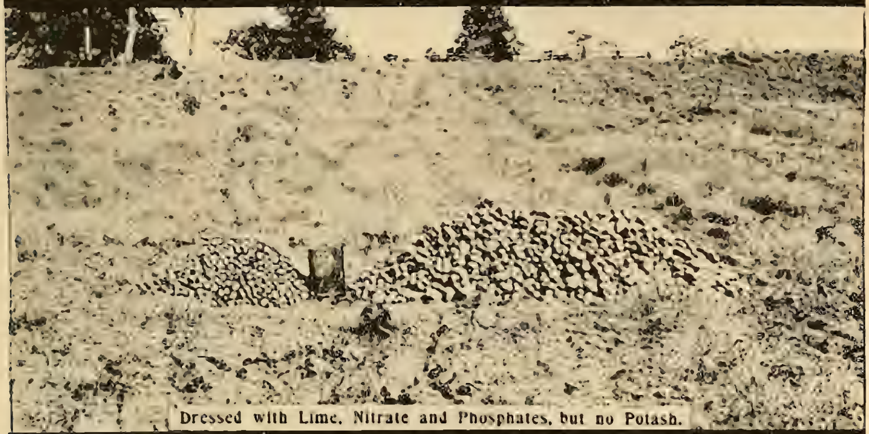
The results of the experiment appear in the following table:

POTATO EXPERIMENT, CONDUCTED BY MR. T. J. STROUD, SHAKER STATION, SEASON OF 1895.

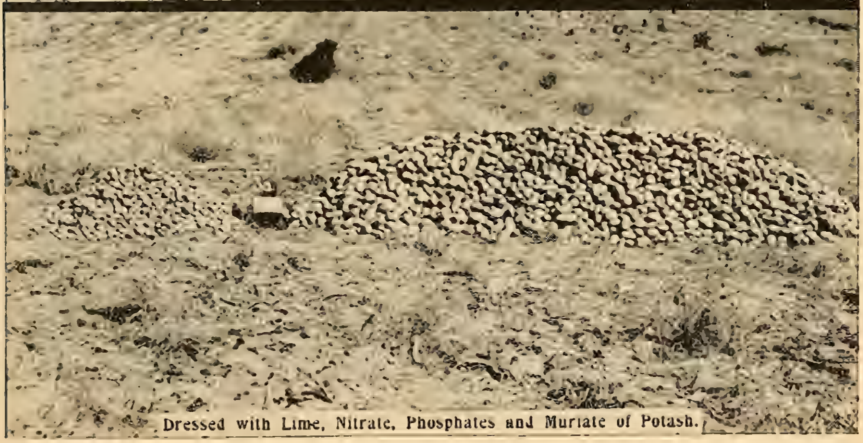
No. of Plot.	Fertilizers Used.	Yield, (pounds) per Plot.						
		Salable.	Small.	Total.	Equivalent Bushels per Acre.	Moisture, per cent.	Starch, per cent.	Per cent. of Starch in Water Free Substance.
1	No fertilizer	436	444	880	73	78.20	16.65	76.39
1a	400 lbs. lime	910	300	1210	101	78.27	16.58	76.32
2	80 lbs. nitrate of soda 123 " acid phosphate	1370	318	1688	140	78.25	16.79	77.13
2a	80 lbs. nitrate of soda 123 " acid phosphate 400 " lime	1207	278	1485	124	78.48	16.51	76.73
3	80 lbs. nitrate of soda 123 " acid phosphate 24 " muriate of potash	2284	222	2506	209	79.01	16.22	77.27
3a	Same as plot 3, with addition of 400 lbs. lime	2386	304	2690	224	78.56	16.48	76.85
4	80 lbs. nitrate of soda 123 " acid phosphate 48 " muriate of potash	2415	450	2865	239	78.98	16.16	76.87
4a	Same as plot 4, with addition of 400 lbs. lime	2434	377	2811	234	79.23	15.44	74.31
5	80 lbs. nitrate of soda 123 " acid phosphate 24 " sulphate of potash	1914	446	2360	197	78.03	16.69	76.04
5a	Same as plot 5, with addition of 400 lbs. lime	1896	335	2231	186	78.56	16.16	75.18
6	90 lbs. Florida soft phosphate	942	278	1220	102	78.74	16.28	76.52
6b	80 lbs. nitrate of soda 90 " Florida soft phosphate	1306	306	1612	134	78.95	15.57	73.99
7	24 lbs. muriate of potash 90 " Florida soft phosphate	----	----	2034	170	----	----	----
7b	80 lbs. nitrate of soda 90 " Florida soft phosphate 24 " muriate of potash	----	----	2210	184	----	----	----
8	200 lbs. Home mixed fertilizer	2512	314	2826	235	78.63	16.47	77.10
9	80 lbs. nitrate of soda 550 " wood ashes	1996	252	2248	187	78.76	16.19	76.23



Dressed with Lime.

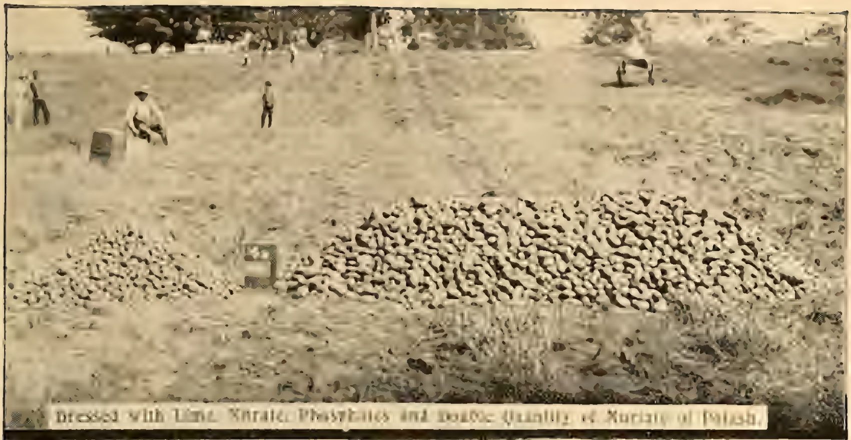


Dressed with Lime, Nitrate and Phosphates, but no Potash.

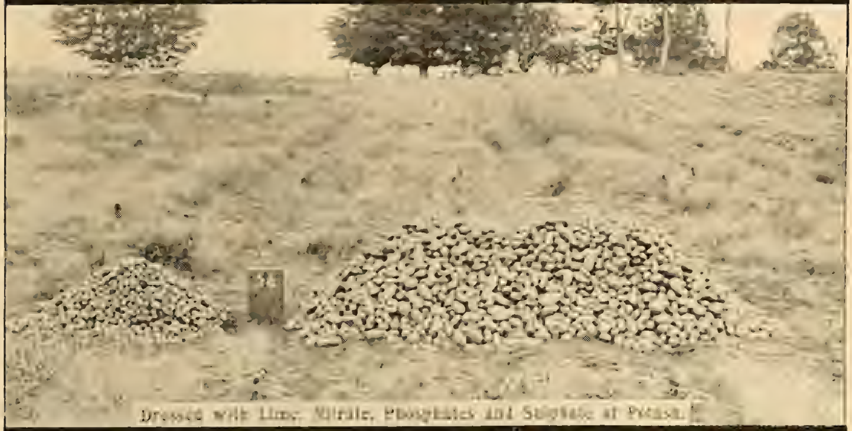


Dressed with Lime, Nitrate, Phosphates and Muriate of Potash.

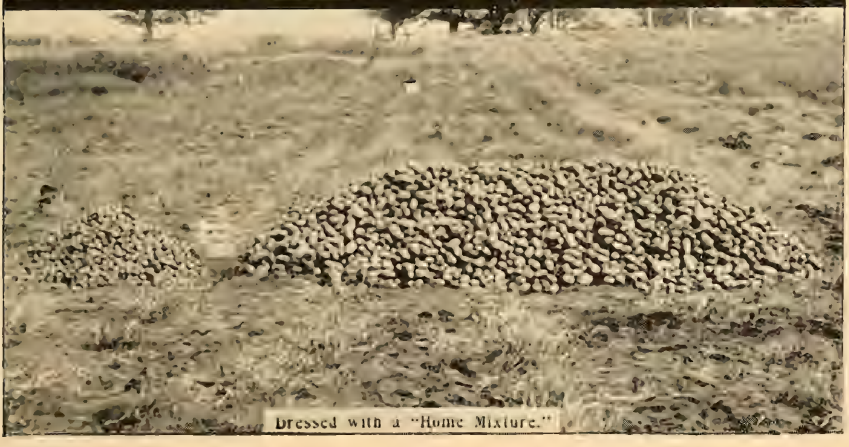
FIELD EXPERIMENT WITH POTATOES. Conducted by T. J. Stroud.



Dressed with Lime, Nitrate, Phosphates and Double Quantity of Muriate of Potash.



Dressed with Lime, Nitrate, Phosphates and Sulphate of Potash.



Dressed with a "Home Mixture."

FIELD EXPERIMENT WITH POTATOES. Conducted by T. J. Stroud.

If the yield of the plot which received no fertilizer is called 100, the yields from the other plots will rank as follows:

No. of Plot.	Dressed with	Relative yield.
1.	Nothing,	100
1a.	Lime,	137
2.	Nitrate and acid phosphate,	192
2a.	Same as 2, with lime,	169
3.	Nitrate, acid phosphate and muriate of potash,	285
3a.	Same as 3, with lime,	306
4.	Nitrate, acid phosphate and double quantity of muriate,	325
4a.	Same as 4, with lime,	319
5.	Nitrate, acid phosphate and sulphate of potash,	268
5a.	Same as 5, with lime,	254
6.	Florida soft phosphate,	139
6b.	Nitrate and Florida phosphate,	183
7.	Muriate and Florida phosphate,	231
7b.	Nitrate, Florida phosphate and muriate of potash,	251
8.	Home mixture,	321
9.	Nitrate and wood ashes,	255

The results of this experiment may be summarized as follows:

1. The yields on plot 4, nitrate, acid phosphate and double quantity of muriate, on 4a, the same fertilizer as on 4 with lime added, and on plot 8, home-mixture, are essentially alike, three times as large as from plot 1, which had no fertilizer, and amounted to over 230 bushels of potatoes per acre.

2. The addition of lime to the fertilizers had but little effect, and in three out of four cases depressed the yield.

3. Muriate of potash gave a larger yield of potatoes per acre than an equivalent quantity of sulphate, by 25 bushels.

4. Florida phosphate alone, plot 6, increased the yield about as much as an application of lime; with nitrate, plot 6b, it still further increased the yield. With potash, plot 7, the yield was greater than with nitrate alone, but the combination of nitrate, Florida phosphate and muriate, plot 7b, yielded more than any two of the three, but 25 bushels per acre less than an equivalent quantity of dissolved bone black with nitrate and muriate, plot 3.

5. The potatoes from the four plots that received muriate contained in their fresh substance 16.22, 16.48, 16.16, 15.44 per cent. of starch respectively, the average being 16.07. The potatoes from the two plots which received sulphate of potash contained 16.69 and 16.16 respectively, the average of which is 16.42.

The potatoes on the plot which received most muriate had a smaller per cent. of starch than any others, with two exceptions (5a and 6b), and the potatoes on the plot with sulphate of potash had the highest per cent. of starch of any except those from plot 2. It is to be noticed, however, that the per cent. of starch in potatoes on plot 5a, which was dressed with high grade sulphate and lime, was as low as any in the experiment, excepting plot 6b.

6. The lower per cent. of starch in the potatoes raised with muriate is due to their higher per cent. of water. The per cent. of starch *in the dry substance* of the potatoes is highest where muriate was used, plot 3. The average per cent. of starch in the dry substance of the potatoes from the four plots on which muriate of potash was used is 76.32; the average on the two sulphate of potash plots is 75.60.

The soil of the experiment field was strikingly deficient in available potash, nitrogen and phosphoric acid. Thus nitrate and dissolved bone black increased the yield of the soil by 92 bushels per acre, and muriate added to the chemicals named made a further increase of 93 bushels.

In this experiment, muriate of potash gave a larger yield than the equivalent amount of sulphate of potash, by 25 bushels per acre.

The starch-content of the fresh potatoes was as high with sulphate of potash as where no fertilizer was used.

The starch-content in the fresh potatoes raised with muriate was about .5 per cent. less than in those raised with equivalent sulphate.

Doubling the quantity of muriate increased the yield and still further depressed the per cent. of starch.

The lower content of starch in potatoes raised with muriate was wholly due to the larger amount of water in them. The dry matter of potatoes raised with muriate contained more starch than those raised with sulphate of potash.

The results here reported naturally differ with the character of the land, quantity of nitrogen applied, weather conditions, etc.

In general the potatoes where muriate was applied contained less starch, by half a per cent. or less, than those raised with sulphate of potash. The yield of potatoes is most likely to be larger with muriate than with sulphate of potash.

The actual potash in sulphate of potash costs about 12 per cent. more than in muriate, so that if 80 pounds of actual potash were applied per acre, the added cost of using sulphate would be about 75 cents.

It is not always and every where advisable to use sulphate rather than muriate of potash on potato land.

When yield alone is sought and there is no possibility of getting an extra price on account of quality, the muriate may be used, partly because, pound for pound of actual potash, it is cheaper than the sulphate, but mainly because it is likely to produce a larger yield.

When used, its unfavorable effect on the quality of the tubers may probably be lessened by putting it on the land early, even the fall before.

When potatoes are to be raised for seed, or when an increased price may be secured because of extra quality of tubers, the sulphate should be used.

EXPERIMENTS IN GROWING TOBACCO WITH DIFFERENT FERTILIZERS.

FINAL REPORT ON THE FERMENTED CROPS OF 1894.

By E. H. Jenkins.

The object of these experiments is to study the effects of certain fertilizers commonly used by our Connecticut growers on the quality of wrapper-leaf tobacco. Each plot under experiment receives the same fertilizers for a term of years in order to test these fertilizers under the varying climatic conditions which a succession of years affords, and final judgment on the quality of the crops is made after they have been fermented in the case and are ready for manufacture.

The work was begun in 1892 and has been carried on each year since then by this Station, in connection with the Connecticut Tobacco Experiment Company.

A full description of this experiment will be found in former reports of this Station, viz.: 1892, pp. 1–24; 1893, pp. 112–144; 1894, pp. 254–284.

An account of the growing, harvesting and curing of the crop of 1894 is printed on pages 270 to 279 of the 17th Annual Report of this Station for 1894.

Samples of the long and short wrappers from each plot, with top leaves and seconds sufficient to fill the case, were cased down at the warehouse of Mr. L. B. Haas in Hartford, on Dec. 13th, 1894. The case lay undisturbed till Dec. 10th, 1895, when it was opened and the samples examined.

Shrinkage during Fermentation.

The tobacco weighed 343 pounds when it was cased. After fermentation it weighed 307 pounds, having lost during twelve months 36 pounds, or 11.1 per cent. The crops of 1892 and 1893 lost about 14 per cent. during fermentation. The crop of 1892 was "well sweated," that of 1893 "unsweated," and that of 1894, which lost nearly 3 per cent. less than the others, "well sweated." It is the *nature* of the change during fermentation—about which almost nothing is known at present—and not the total loss in the case, which determines the effect of the process on the quality of the leaf.

JUDGMENT OF THE EXPERT.

Each lot of tobacco was marked with a number, different from the one used in the previous year, and which gave no indication of the plot from which the tobacco came.

The lots were examined and graded by Mr. Benjamin L. Haas of Hartford, who has graded the two previous crops. Mr. Haas devoted two days to the work, and there has thus been secured a perfectly unbiased and intelligent judgment by an expert fully acquainted with the present requirements of the trade.

A strict judgment has been given, noting all defects in the leaf.

The crops on the experiment field were in general of quite as good quality as those grown elsewhere in the neighborhood.

Following is the grading given by Mr. Haas, in detail:

LOT A.

Fertilizers: 1360 lbs. cottonseed meal and 1560 lbs. cotton hull ashes per acre, containing 105 lbs. nitrogen, 150 lbs. phosphoric acid and 339 lbs. potash. Cost, $53.12 per acre.

Yield: 740 lbs. long wrappers per acre.
230 " short " " "
Total 970 "

Quality:—*Burn*, free, does not coal, holds fire fairly well. *Ash*, clear white. *Vein*, small, some white vein. *Texture*, well sweated, open grain, thin and good finish. *Size*, medium to large. *Ripeness*, ripe. *Colors*, light to medium. *Yield*, very profitable. *Soundness*, sound. *Stem*, small. *Relative Rank*, 5th.

LOT B.

Fertilizers: 1826 lbs. linseed meal, 1572 lbs. cotton hull ashes per acre, containing 105 lbs. nitrogen, 143 lbs. phosphoric acid and 339 lbs. potash. Cost, $60.02 per acre.

Yield: 690 lbs. long wrappers per acre.
205 " short " " "
Total 895 "

Quality:—*Burn*, does not coal, holds fire very well. *Ash*, clear gray. *Vein*, small, curly. *Texture*, well sweated, good grain, lacks finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, clear, bright, medium. *Yield*, fairly profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 6th.

Lot C.

Fertilizers: 2260 lbs. cottonseed meal, 1480 lbs. cotton hull ashes per acre, containing 175 lbs. nitrogen, 170 lbs. phosphoric acid and 339 lbs. potash. Cost, $63.24 per acre.

Yield: 880 lbs. long wrappers per acre.
260 " short " " "
Total 1140 "

Quality:—*Burn*, does not coal, holds fire very well. *Ash*, clear white, hard. *Vein*, good. *Texture*, well sweated, good grain, good finish. *Size*, little above medium. *Ripeness*, ripe. *Colors*, dark, mottled. *Yield*, fairly profitable. *Soundness*, sound. *Stem*, small. *Relative rank*, 11th.

Lot D.

Fertilizers: 2720 lbs. cottonseed meal, 1440 lbs. cotton hull ashes per acre, containing 210 lbs. nitrogen, 180 lbs. phosphoric acid and 340 lbs. potash. Cost, $68.44 per acre.

Yield: 1050 lbs. long wrappers per acre.
280 " short " " "
Total 1330 "

Quality:—*Burn*, does not coal, fairly free. *Ash*, clear white. *Vein*, curly, with some white vein. *Texture*, well sweated, open grain, lacks finish. *Size*, medium to large. *Ripeness*, ripe. *Colors*, medium. *Yield*, unprofitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 16th.

Lot E.

Fertilizers: 1900 lbs. castor pomace and 1640 lbs. cotton hull ashes per acre, containing 105 lbs. nitrogen, 148 lbs. phosphoric acid and 347 lbs. potash. Cost, $59.70 per acre.

Yield: 710 lbs. long wrappers per acre.
240 " short " " "
Total 950 "

Quality:—*Burn*, coals slightly, holds fire fairly well. *Ash*, mixed gray. *Vein*, curly and white. *Texture*, medium, well sweated, close grain, lacks finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, medium to dark, mottled. *Yield*, unprofitable. *Soundness*, sound. *Stem*, medium to small. *Relative rank*, 28th.

Lot F.

Fertilizers: 1820 lbs. linseed meal, 640 lbs. cotton hull ashes and 260 lbs. Cooper's bone per acre, containing 105 lbs. nitrogen, 153 lbs. phosphoric acid and 152 lbs. potash. Cost, $42.48 per acre.

Yield: 820 lbs. long wrappers per acre.
260 " short " " "
Total 1080 "

Quality:—*Burn*, coals slightly, holds fire fairly. *Ash*, clear white, does not flake. *Vein*, good. *Texture*, well sweated, inclined to be close grain, good finish. *Size*, little above medium. *Ripeness*, ripe. *Colors*, medium to dark. *Yield*, very profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 4th.

Lot G.

Fertilizers: 3160 lbs. castor pomace and 1540 lbs. cotton hull ashes per acre, containing 175 lbs. nitrogen, 162 lbs. phosphoric acid and 338 lbs. potash. Cost, $72.52 per acre.

Yield: 860 lbs. long wrappers per acre.
280 " short " " "
Total 1140 "

Quality:—*Burn*, coals slightly, fairly free. *Ash*, clear gray. *Vein*, medium, white vein. *Texture*, thin, well sweated, good grain, fair finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, clear, dark. *Yield*, very profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 15th.

Lot H.

Fertilizers: 3780 lbs. castor pomace and 1540 lbs. cotton hull ashes per acre, containing 210 lbs. nitrogen, 171 lbs. phosphoric acid and 340 lbs. potash. Cost, $79.56 per acre.

Yield: 1050 lbs. long wrappers per acre.
280 " short " " "
Total 1330 "

Quality:—*Burn*, does not coal, holds fire very well. *Ash*, clear white, hard. *Vein*, good. *Texture*, well sweated, good grain, lacks finish. *Size*, little above medium. *Ripeness*, ripe. *Colors*, medium to dark. *Yield*, very profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 14th.

Lot I.

Fertilizers: 1900 lbs. castor pomace, 1640 lbs. cotton hull ashes, 640 lbs. nitrate of soda (the latter in two applications after planting) per acre, containing 208 lbs. nitrogen, 148 lbs. phosphoric acid and 347 lbs. of potash. Cost, $75.70 per acre.

Yield: 920 lbs. long wrappers per acre.
250 " short " " "
Total 1170 "

Quality:—*Burn*, does not coal, fairly free. *Ash*, clear gray. *Vein*, inclined to be curly and some white. *Texture*, well sweated, grain rather open, lacks finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, dark and somewhat mottled. *Yield*, fairly profitable. *Soundness*, sound. *Stem*, rather small. *Relative rank*, 20th.

Lot J.

Fertilizers: 1900 lbs. castor pomace, 1640 lbs. cotton hull ashes, and 640 lbs. nitrate of soda (the latter applied after planting) per acre, containing 208 lbs. nitrogen, 148 lbs. phosphoric acid and 347 lbs. potash. Cost, $75.70 per acre.

Yield: 980 lbs. long wrappers per acre.
260 " short " " "
Total 1240 "

Quality:—*Burn*, does not coal, fairly free. *Ash*, clear gray. *Vein*, some white, medium. *Texture*, well sweated, rather close grain, lacks finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, medium to dark, somewhat mottled. *Yield*, fairly desirable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 19th.

Lot K.

Fertilizers: 1360 lbs. cottonseed meal, 1160 lbs. double sulphate of potash and magnesia, and 380 lbs. Cooper's bone per acre, containing 105 lbs. of nitrogen, 149 lbs. phosphoric acid and 341 lbs. of potash. Cost, $40.55 per acre.

Yield: 930 lbs. long wrappers per acre.
225 " short " " "
Total 1155 "

Quality:—*Burn*, coal slightly, holds fire fairly. *Ash*, clear gray. *Vein*, inclined to be white. *Texture*, well sweated, good grain, lacks finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, medium, mottled. *Yield*, not profitable. *Soundness*, fairly sound. *Stem*, rather small. *Relative rank*, 17th.

Lot L.

Fertilizers: 1360 lbs. cottonseed meal, 1160 lbs. double sulphate of potash and magnesia, 380 lbs. Cooper's bone, and 300 lbs. lime per acre, containing 105 lbs. of nitrogen, 149 lbs. phosphoric acid and 341 lbs. of potash. Cost, $43.55 per acre.

Yield: 760 lbs. long wrappers per acre.
270 " short " " "
Total 1030 "

Quality:—*Burn*, does not coal, does not hold fire well. *Ash*, clear white. *Vein*, small, with some white. *Texture*, thin, well sweated, open grain, good finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, medium to dark. *Yield*, very profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 7th.

Lot M.

Fertilizers: 1360 lbs. cottonseed meal, 660 lbs. high grade sulphate of potash and 380 lbs. Cooper's bone per acre, containing 105 lbs. of nitrogen, 149 lbs. phosphoric acid and 338 lbs. of potash. Cost, $41.30 per acre.

Yield: 680 lbs. long wrappers per acre.
210 " short " " "
Total 890 "

Quality:—*Burn*, coals slightly, holds fire fairly well. *Ash*, mixed gray. *Vein*, small, some white. *Texture*, well sweated, close grain, lacks finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, medium to light but mottled. *Yield*, unprofitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 26th.

Lot N.

Fertilizers: 1360 lbs. cottonseed meal, 660 high grade sulphate of potash, 380 lbs. Cooper's bone and 300 lbs. lime per acre, containing 105 lbs. nitrogen, 149 lbs. phosphoric acid and 338 lbs. potash. Cost, $44.30 per acre.

Yield: 720 lbs. long wrappers per acre.
220 " short " " "
Total 940 "

Quality:—*Burn*, coals very slightly, holds fire fairly. *Ash*, mixed gray. *Vein*, inclined to be white. *Texture*, well sweated, fair grain but inclined to be close, lacks finish. *Size*, good. *Ripeness*, ripe. *Colors*, medium, mottled. *Yield*, unprofitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 25th.

LOT O.

Fertilizers: 1360 lbs. cottonseed meal, 580 lbs. carbonate of potash and 380 lbs. Cooper's bone per acre, containing 105 lbs. nitrogen, 149 lbs. phosphoric acid and 339 lbs. potash. Cost, $72.45 per acre.

Yield: 780 lbs. long wrappers per acre.
240 " short " " "
Total 1020 "

Quality:—*Burn*, coals, holds fire fairly. *Ash*, mixed gray. *Vein*, small amount of white vein, otherwise good. *Texture*, well sweated, fairly open grain, good finish. *Size*, very desirable. *Colors*, medium to dark. *Yield*, very profitable. *Soundness*, sound. *Stem*, small. *Relative rank*, 13th.

LOT P.

Fertilizers: 1360 lbs. cottonseed meal, 1740 lbs. double carbonate of potash and magnesia, and 380 lbs. Cooper's bone per acre, containing 105 lbs. nitrogen, 149 lbs. phosphoric acid and 340 lbs. potash. Cost, $57.08 per acre.

Yield: 660 lbs. long wrappers per acre.
220 " short " " "
Total 880 "

Quality:—*Burn*, does not coal, holds fire very well. *Ash*, hard and white. *Vein*, good. *Texture*, well sweated, very thin, open grain, good finish. *Size*, very desirable. *Ripeness*, ripe. *Colors*, fairly clear, medium to dark. *Yield*, very profitable. *Soundness*, sound. *Stem*, small. *Relative rank*, 2d.

LOT Q.

Fertilizers: 2000 lbs. Baker's A. A. Superphosphate, 4000 lbs. Baker's tobacco manure per acre, containing 241 lbs. nitrogen, 489 lbs. phosphoric acid and 495 lbs. potash.

Yield: 920 lbs. long wrappers per acre.
190 " short " " "
Total 1110 "

Quality:—*Burn*, coals slightly, does not hold fire. *Ash*, muddy gray. *Vein*, prominent, curly. *Texture*, well sweated, thin, papery, close grain. *Size*, medium to large. *Ripeness*, ripe. *Colors*, medium mottled. *Yield*, unprofitable. *Soundness*, sound. *Stem*, inclined to be large. *Relative rank*, 29th.

LOT R.

Fertilizers: 2000 lbs. Stockbridge Tobacco Manure and 500 lbs. of the same, used as a starter, per acre, containing 149 lbs. nitrogen, 281 lbs. phosphoric acid and 283 lbs. potash.

Yield:	730	lbs. long wrappers per acre.
	230	" short " " "
Total	960	"

Quality:—*Burn*, coals slightly, does not hold fire. *Ash*, mixed gray. *Vein*, small, but some white. *Texture*, well sweated, open grain, lacks finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, dark, mottled. *Yield*, fairly profitable. *Soundness*, sound. *Stem*, small. *Relative rank*, 23d.

LOT S.

Fertilizers: 3000 lbs. Stockbridge Tobacco Manure, 500 lbs. of the same, used as a starter per acre, containing 209 lbs. nitrogen, 393 lbs. phosphoric acid and 396 lbs. potash.

Yield:	910	lbs. long wrappers per acre.
	250	" short " "
Total	1160	"

Quality:—*Burn*, coals slightly, holds fire fairly well. *Ash*, mixed gray. *Vein*, inclined to be white. *Texture*, well sweated, fair grain, lacks finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, medium, mottled. *Yield*, not profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 22d.

LOT T.

Fertilizers: 880 lbs. dry ground fish, 440 lbs. nitrate of soda, and 300 lbs. lime per acre, containing 142 lbs. nitrogen, and 60 lbs. phosphoric acid. Cost, $31.60 per ton.

Yield:	740	lbs. long wrappers per acre.
	160	" short " "
Total	900	"

Quality :—*Burn*, coals slightly, does not hold fire. *Ash*, white. *Vein*, white and curly. *Texture*, well sweated, open grain, without finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, dark and mottled. *Yield*, very unprofitable. *Soundness*, sound. *Stem*, small. *Relative rank*, 27th.

Lot U.

Fertilizers: 2200 lbs. Mapes' Tobacco Manure, wrapper brand, and 600 lbs. Mapes' Starter per acre, containing 158 lbs. of nitrogen, 211 lbs. phosphoric acid, and 278 lbs. potash.

Yield: 1110 lbs. long wrappers per acre.
180 " short " "
Total 1290 "

Quality :—*Burn*, coals slightly, holds fire fairly. *Ash*, medium, clear gray. *Vein*, prominent, curly, inclined to be white. *Texture*, well sweated, good grain. *Size*, too large. *Ripeness*, ripe. *Colors*, medium. *Yield*, unprofitable. *Soundness*, sound. *Stem*, large. *Relative rank*, 18th.

Lot V.

Fertilizers: 2400 lbs. Mapes' Tobacco Manure, wrapper brand, and 400 lbs. Mapes' Starter per acre, containing 163 lbs. nitrogen, 196 lbs. phosphoric acid, and 294 lbs. potash.

Yield: 870 lbs. long wrappers per acre.
225 " short " "
Total 1095 "

Quality :—*Burn*, coals slightly, does not hold fire. *Ash*, mixed gray. *Vein*, small, no white vein. *Texture*, thin, well sweated, open grain, no finish. *Size*, medium to large. *Ripeness*, ripe. *Colors*, medium to dark, dry. *Yield*, unprofitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 24th.

Lot W.

Fertilizers: 2400 lbs. Mapes' Tobacco Manure per acre, containing 151 lbs. of nitrogen, 143 lbs. phosphoric acid, and 280 lbs. potash.

Yield: 990 lbs. long wrappers per acre.
270 " short " "
Total 1260 "

Quality :—*Burn*, inclined to coal, does not hold fire very well. *Ash*, mixed gray, does not flake. *Vein*, small, inclined to be white. *Texture*, well sweated, thin, good grain, good style. *Size*, little above medium. *Ripeness*, ripe. *Colors*, medium to light. *Yield*, very profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 8th.

Lot X.

Fertilizers: 2000 lbs. Sanderson's Tobacco Formula per acre, containing 103 lbs. nitrogen, 281 lbs. phosphoric acid, and 105 lbs. potash.

Yield: 680 lbs. long wrappers per acre.
240 " short " "
Total 920 "

Quality:—*Burn*, coals slightly, does not hold fire. *Ash*, mixed gray. *Vein*, small. *Texture*, well sweated, open grain, good finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, light to medium. *Yield*, fair. *Soundness*, sound. *Stem*, small. *Relative rank*, 9th.

Lot Y.

Fertilizers: 1360 lbs. cotton seed meal, 8540 lbs. wood ashes, and 80 lbs. Cooper's bone per acre, containing 105 lbs. nitrogen, 147 lbs. phosphoric acid, 340 lbs. potash. Cost, $70.34 per acre.

Yield: 840 lbs. long wrappers per acre.
200 " short " "
Total 1040 "

Quality:—*Burn*, coals slightly, holds fire fairly well. *Ash*, clear gray. *Vein*, some white. *Texture*, well sweated, open grain, good finish. *Size*, medium to large. *Ripeness*, ripe. *Colors*, clear, medium to dark. *Yield*, fairly profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 12th.

Lot Z.

Fertilizers: 1300 lbs. dry ground fish, 1260 lbs. double sulphate of potash and magnesia, and 200 lbs. Cooper's bone per acre, containing 104 lbs. nitrogon, 146 lbs. phosphoric acid, and 342 lbs. potash. Cost, $47.60 per acre.

Yield: 670 lbs. long wrappers per acre.
250 " short " "
Total 920 "

Quality:—*Burn*, does not coal, holds fire fairly well. *Ash*, clear gray. *Vein*, small, some white. *Texture*, too hard sweated, thin, open grain, good finish. *Size*, very desirable. *Ripeness*, ripe. *Colors*, dark and mottled. *Yield*, very profitable. *Soundness*, sound. *Stem*, very small. *Relative rank*, 3d.

Lot AA.

Fertilizers: 10 to 12 cords stable manure, on half the plot 500 lbs. Swift-Sure Superphosphate per acre, containing (estimated) 125 lbs. nitrogen, 143 lbs. phosphoric acid, and 171 lbs. potash.

Yield: 380 lbs. long wrappers per acre.
180 " short " "
Total 560 "

Quality:—*Burn*, coals slightly, holds fire well. *Ash*, mixed gray. *Vein*, small, very little white vein. *Texture*, well sweated, thin, open grain, good finish. *Size*, medium to large. *Ripeness*, ripe. *Colors*, light to medium. *Yield*, very profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 1st.

Lot BB.

Fertilizers: 6000 lbs. tobacco stems, 2640 lbs. castor pomace, on half the plot 500 lbs. Swift-sure Superphosphate per acre, containing (estimated) 253 lbs. nitrogen, 146 lbs. phosphoric acid and 539 lbs. potash. Cost, $83.18.

Yield: 600 lbs. long wrappers per acre.
180 " short " "
Total 780 "

Quality:—*Burn*, coals very slightly, holds fire fairly well, free burn. *Ash*, clear gray. *Vein*, small, some white. *Texture*, well sweated, rather thin, open grain, lacks finish. *Size*, desirable. *Ripeness*, ripe. *Colors*, dark. *Yield*, fairly profitable. *Soundness*, sound. *Stem*, medium to small. *Relative rank*, 21st.

Lot CC.

Fertilizers: 3000 lbs. Pinney's Formula per acre, containing 131 lbs. nitrogen, 196 lbs. phosphoric acid and 305 lbs. potash.

Yield: 620 lbs. long wrappers per acre.
230 " short " "
Total 850 "

Quality:—*Burn*, coals, holds fire fairly well. *Ash*, mixed gray. *Vein*, small, not white. *Texture*, well sweated, open grain, good finish. *Size*, medium to large. *Ripeness*, ripe. *Colors*, clear, medium to dark. *Yield*, very profitable. *Soundness*, sound. *Stem*, medium. *Relative rank*, 10th.

The lots in order of their value as wrappers, taking all points into consideration, are graded as follows:

AA (best),	1st.
P,	2d.
Z,	3d.
F,	4th.
A,	5th.
B,	6th.
L,	7th.
W,	8th.
X,	9th.
CC,	10th.
C,	11th.
Y,	12th.
O,	13th.
H,	14th.
G,	15th.
D,	16th.
K,	17th.
U,	18th.
J,	19th.
I,	20th.
BB,	21st.
S,	22d.
R,	23d.
V,	24th.
N,	25th,
M,	26th.
T,	27th.
E,	28th.
Q,	29th.

General Remarks.—The short wrappers from all the plots contain a larger per cent. of fine wrappers than the short wrappers of the experiment crops of 1892 or 1893 contained.

The first ten in the above list differ *very* little in quality. The tobaccos all show a great improvement over the 1893 crops, and the first fifteen in the above list are all very desirable tobaccos.

The presence of white vein has impaired the salability of the crops somewhat, but this is considered a defect of curing rather than of growing.

DISCUSSION OF THE RESULTS.

The crop of 1894 was a dry-weather crop. During the tobacco-growing season of 1892 nearly 16 inches of rain fell, and the quality of the crop was exceptionally good. In 1893 only 6.2 inches of rain fell while the crop was standing, and the crop was exceptionally poor: its one good feature being the "burn," which was even better than that of 1892 crop.

In 1894 the rain-fall, while the tobacco was in the field, amounted to 7.16 inches, an inch more than in 1893. On fifteen days out of the 83 days the conditions were reported as "too dry" by the superintendent of the field work.

The total rain-fall, however, gives a very inadequate idea of the supply of water to the crop. A succession of showers at tolerably uniform intervals is most favorable to the crop. Two or three heavy down-pours of rain with long periods of dryness between, even if more rain falls than in the former case, are much less favorable.

In 1894 there was a time in June when no rain fell for 16 days, and no rain fell for the last 10 days of June, but for the rest of the season some rain fell in every week.

The crop received no great amount of rain, but the rain-fall was well distributed and the quality of the crop was very fair.

Comparative Fire-Holding Capacity.

In the following table is given the relative fire-holding capacity of the long and short wrappers from each plot determined by Messrs. Winton and Ogden, by the method described in the Report of this Station for 1893, p. 124.

The lot which held fire the shortest time is marked 100, and the other lots are so marked as to express numerically their capacity for holding fire: for example, lot T held fire for a shorter time than any other (100), lot A held fire more than four times as long (436).

Comparative Fire-Holding Capacity. Fermented Crop of 1894.

	Long Wrappers.	Short Wrappers.	Calculated from mean of both.	Average number of seconds during which leaf holds fire.	
				Unfermented.	Fermented.
A	485	409	436	11.9	45.8
B	331	315	318	11.0	33.4
C	292	241	260	12.0	27.3
D	251	197	218	11.8	22.9
E	257	209	227	9.1	23.9
F	150	100	120	7.8	12.6
G	255	340	298	9.7	31.2
H	400	190	277	11.9	29.0
I	223	198	206	10.6	21.6
J	194	215	204	14.0	21.5
K	228	237	230	7.6	24.1
L	162	178	168	6.8	17.6
M	172	127	145	7.9	15.2
N	162	217	190	9.6	19.9
O	182	248	216	11.5	22.7
P	430	337	374	13.7	39.3
Q	107	111	107	5.5	11.3
R	153	192	172	10.2	18.1
S	190	243	216	8.1	22.7
T	100	103	100	6.9	10.5
U	137	204	172	7.8	18.0
V	160	180	170	8.0	17.6
W	181	230	205	8.9	21.6
X	101	103	101	6.4	10.6
Y	305	309	303	15.2	31.8
Z	253	250	248	10.6	26.0
AA	216	326	273	7.8	28.7
BB	170	239	205	9.8	21.5
CC	298	192	236	9.9	24.8

The fire-holding capacity of the leaf was in every case increased by the fermentation, though not by any means equally in all cases.

The *average* fire-holding capacity of the three year's crops already fermented are :

	Before Fermentation.	After Fermentation.
Crop of 1892	9.6	24.4
Crop of 1893	9.0	18.0
Crop of 1894	9.7	23.2

There is substantial agreement in most cases between the judgment as to fire-holding capacity by the expert and the results of laboratory tests.

Thus the seven lots L, Q, R, T, V, W, X, which did not hold fire well in the expert's judgment, were all far below the average fire-holding capacity as determined in the laboratory. The five lots judged to hold fire "very well," B, C, H, P, AA, had a relatively high fire-holding capacity as determined by the chemist.

Exceptional are lots F, M, N, U, BB, which "hold fire fairly" in the opinion of the expert, but as determined by laboratory tests are quite below the average, and A and Y, which are judged to "hold fire fairly," yet have a very high fire-holding capacity as determined in the laboratory.

Tendency to coal is not always associated with small fire-holding capacity. Lots O and CC, which "coaled" most, had a fire-holding capacity above the average.

The relative average fire-holding capacity of all the lots which did not coal was 265, while that of the lots which coaled slightly was 190.

NUMBER OF FERMENTED LEAVES TO THE POUND.

On page 281, Report of 1894, are given the number of leaves per pound of each lot of *pole-cured* tobacco of this crop.

The number of leaves per pound of this same crop after fermentation in the case, appear in the following table.

From 25 to 35 leaves were weighed on a balance sensitive to $\frac{1}{30}$ of an ounce, and from these weights the results in the table are computed.

Number of Fermented Leaves to the Pound. Crop of 1894.

	Long Wrappers.	Short Wrappers.		Long Wrappers.	Short Wrappers.
A	68	101	P	76	111
B	66	93	Q	72	94
C	67	97	R	68	109
D	73	93	S	61	96
E	80	101	T	77	96
F	72	89	U	63	95
G	70	97	V	72	89
H	74	89	W	76	95
I	65	111	X	71	97
J	73	105	Y	72	93
K	70	95	Z	70	108
L	66	88	AA	64	92
M	78	112	BB	70	85
N	72	101	CC	64	90
O	79	106			

The average of these figures is as follows:

Number of Leaves to the Pound.

	Pole-cured.	Fermented.
Short wrappers	88	97
Long wrappers	64	71

Effects of Different Forms of Nitrogen.

Cotton Seed Meal and Castor Pomace.

Cotton Seed Meal and Castor Pomace were each applied to three plots in quantities supplying 105, 175 and 210 lbs. per acre of nitrogen respectively, with 150 lbs. of phosphoric acid and 340 lbs. of potash in form of cotton hull ashes.

In 1894 the yield of wrappers was practically the same from the Cotton Seed plots as from the Castor Pomace plots.

In both cases the yield regularly increased with the increase in nitrogen.

The number of wrapper leaves per pound was practically the same where cotton seed was used as where castor pomace was used.

In both cases the number of leaves per pound was slightly greater with the smaller amount of nitrogen than with the larger.

The per cent. of wrappers in the crops was nearly the same with both fertilizers and increased in each case with the increase of nitrogen in the fertilizers.

The quality of the leaf raised on Cotton Seed Meal was somewhat better than that raised with Castor Pomace.

Thus lots A, C, D (Cotton Seed Meal) were graded 5th, 11th and 16th. Lots E, G, H (Castor Pomace) were graded 28th, 15th, 14th. Excepting lot E, there is, however, little difference in quality between the two.

Linseed Meal.

Plot B, which received 105 pounds of nitrogen per acre in this form, yielded 65 pounds less per acre of wrappers than the corresponding plots A and E, dressed with Cotton Seed and Pomace; the per cent. of wrappers in the crop was about the same, the weight per leaf was somewhat greater, and the quality was of the best, ranking 6th.

Plot F, with the same amount of linseed meal and phosphoric acid, but half the quantity of potash that was put on B, yielded 115 pounds more of wrappers per acre than A or E, but in other ways the crop differed little from that on F, and was graded 4th.

Practically the same results were obtained with the previous crop.

Fish.

Plot Z was dressed with 1300 pounds of dry ground fish, which supplied 105 pounds of nitrogen and 1260 pounds of double sulphate of potash and magnesia. It is not strictly comparable with plots A (Cotton Seed Meal), E (Castor Pomace), and B (Linseed Meal), in that the form of potash was different,—though the quantity of actual potash supplied was the same.

The yield of wrappers was somewhat less than from plots A and E, and somewhat more than from B. The quality of leaf was, however, nearly as good as any, ranking 3d.

Nitrate of Soda, at First and Second Cultivation.

(Plots I and J compared with H.)

The point of this experiment is to ascertain the effect on the crop of supplying one-third of the nitrogen of a heavy application (210 pounds), as a top dressing in the form of nitrate of soda in one application at the time of the first cultivation (plot I), or in two applications at the time of the first and second cultivation (plot J). The effect in both cases was decidedly injurious to the quality of the wrappers, though plot J yielded 180 pounds more of wrappers than H. In 1893 J yielded 165 pounds more wrappers than H, and the quality of the wrappers was even better. Plot I, which received all the nitrate in one application, produced less tobacco and of inferior quality.

In 1894 the effect in each case was somewhat injurious. J produced 70 pounds more wrapper leaf than I, but 90 pounds less than H. The wrapper leaves on I and J were somewhat lighter in weight than on H, but the quality was not quite as good.

Stable Manure.

Plot AA was dressed with 10 to 12 cords of stable manure and some Swift Sure Superphosphate as a starter.

The yield of wrappers was very small, 560 pounds per acre, scarcely more than half the average yield of all the plots taken together.

The per cent. of wrappers in the crop was also the smallest of any. But the *quality* of the leaf was the very best of all and was ranked first. The calculated quantity of nitrogen on this plot was 125 pounds per acre. It is quite likely that this was not all readily available, and that the small crop may be explained by a deficiency of nitrogen.

Tobacco Stems.

Plot BB, dressed with three tons of tobacco stems per acre and 2640 pounds of Castor Pomace, with 500 pounds of Swift Sure Superphosphate, yielded 780 pounds of wrapper leaf, which was of less than average quality.

EFFECT OF DIFFERENT FORMS OF POTASH.

Plots A, K, L, M, N, O, P, Y, were dressed with like quantities of nitrogen (in form of Cotton Seed Meal), phosphoric acid and potash; but the potash was supplied in different forms.

The plot which received double sulphate of potash and magnesia yielded the most wrappers per acre, 1155 pounds.

The yield from the double sulphate of potash and magnesia with lime, carbonate of potash, and wood ashes were about alike, 1020 to 1040 pounds. Cotton hull ashes and high grade sulphate with lime yielded 970 to 980 pounds, while the high grade sulphate without lime, and the double carbonate of potash and magnesia yielded least (880 to 890 pounds of wrappers per acre).

The expert graded the lots raised with cotton hull ashes, double sulphate of potash and magnesia *with lime*, double carbonate of potash and magnesia and wood ashes, 5th, 7th, 2d and 12th, respectively, among the very best in the whole experiment.

The lots raised with carbonate of potash, and double sulphate of potash and magnesia *without lime*, ranked next, 13th and 17th, while those raised with high grade sulphate, with and without lime, were among the poorest, 25th and 26th.

Notice is also called to the facts that lot Z raised with fish and double sulphate of potash and magnesia ranked 3d, and that lot F, which received only half the quantity of potash applied to plot B, ranked 4th, i. e., among the very best.

It should be remembered in considering the results of 1894, that it is not designed to draw any definite conclusions from these experiments till five successive crops have been grown, cured, sweated, and finally examined and graded by the expert. The fourth crop is now cased down for fermentation, and the fifth is to be grown in the summer of 1896.

EXPERIMENTS IN GROWING TOBACCO WITH DIFFERENT FERTILIZERS. SEASON OF 1895.

By E. H. Jenkins.

These experiments are in continuation of those begun in 1892 in coöperation with the Connecticut Tobacco Experiment Co. of Poquonock in the town of Windsor.

Full particulars regarding the land, the conduct of the experiments and their results are given in the Reports of this Station for 1892, pages 1 to 24; for 1893, pages 112 to 144; for 1894, pages 254 to 284.

Fertilizers.

The fertilizers used in 1895 were sampled and analyzed by Messrs. Winton and Ogden, with the following results:

Composition and Cost of Fertilizers Used.

	Cost Per Ton.	Nitrogen.	Phosphoric Acid.	Potash.
Nitrate of Soda	$50.00	15.03	----	----
Cotton Seed Meal	22.00	6.65	2.35	1.73
Castor Pomace	15.00	5.04	4.18	1.81
Linseed Meal	27.00	6.29	1.66	1.24
Tobacco Stems	14.00	1.90*	.60*	8.10*
Cooper's Bone	28.00	2.24	26.65	----
Cotton Hull Ashes	45.00	----	7.04	2.41
Wood Ashes	10.40	----	2.43	4.28
High Grade Sulphate of Potash	50.00	----	----	50.39
Carbonate of Potash	170.00†	----	----	54.10
Double Carbonate Potash and Magnesia	39.00‡	----	----	18.10
Double Sulphate Potash and Magnesia	30.00	----	----	28.39
Fish	35.00	9.26	7.36	----

The chemicals used for each plot were accurately weighed and labeled by the Station representative, mixed thoroughly and bagged by Mr. DuBon and himself.

The bags were carried to the several plots by Mr. DuBon, and their contents were sowed under his constant supervision.

The following table shows the plan of the experiment, the fertilizers applied, with the cost of each as far as known, and the quantities of nitrogen, phosphoric acid and potash contained in them.

---

* Estimated. † By single pound; ton rates would be much lower

‡ Total cost of importing a one ton lot from Stassfurt.

FERTILIZERS APPLIED, SEASON OF 1895.

Name of Plot.	FERTILIZERS APPLIED. Pounds per Acre.	Cost per Acre.	Fertilizer contains pounds.		
			Nitrogen.	Phosphoric Acid.	Potash.
A	1579 Cotton Seed Meal 1297 Cotton Hull Ashes	$46.55	105	159	340
B	1669 Linseed Meal 1324 Cotton Hull Ashes	52.32	105	152	340
C	2631 Cotton Seed Meal 1221 Cotton Hull Ashes	56.41	175	177	340
D	3158 Cotton Seed Meal 1184 Cotton Hull Ashes	61.38	210	186	340
E	2083 Castor Pomace 1254 Cotton Hull Ashes	43.83	105	205	340
F	1669 Linseed Meal 536 Cotton Hull Ashes 277 Cooper's Bone	38.47	105	152	150
G	3472 Castor Pomace 1149 Cotton Hull Ashes	51.87	175	253	340
H	4166 Castor Pomace 1097 Cotton Hull Ashes	55.93	210	277	340
I	2083 Castor Pomace 1254 Cotton Hull Ashes 320 Nitrate of Soda* 320 Nitrate of Soda†	59.84	210	205	340
J	2083 Castor Pomace 1254 Cotton Hull Ashes 640 Nitrate of Soda*	59.84	210	205	340
K	1579 Cotton Seed Meal 1102 Double Sulphate of Potash and Magnesia 457 Cooper's Bone	40.29	105	159	340
L	1579 Cotton Seed Meal 1102 Double Sulphate of Potash and Magnesia 457 Cooper's Bone 300 Lime	42.27	105	159	340
M	1579 Cotton Seed Meal 621 High Grade Sulphate of Potash 457 Cooper's Bone	39.28	105	159	340
N	1579 Cotton Seed Meal 621 High Grade Sulphate of Potash 457 Cooper's Bone 300 Lime	41.26	105	159	340

* Applied between the rows at the time of first cultivation.

† Applied between the rows at the time of second cultivation.

FERTILIZERS APPLIED, SEASON OF 1894

Name of Plot.	FERTILIZERS APPLIED. Pounds per Acre.	Cost per Acre.	Fertilizer contains pounds.		
			Nitrogen.	Phosphoric Acid.	Potash.
O	1579 Cotton Seed Meal 578 Carbonate of Potash 457 Cooper's Bone	$72.90	105	159	340
P	1579 Cotton Seed Meal 1728 Double Carbonate Potash and Magnesia 457 Cooper's Bone	57.46	105	159	340
Q	2000 Baker's A. A. Superphosphate 4000 Baker's Tobacco Manure	----	240	453	434
R	2000 Stockbridge Tobacco Manure 500 Stockbridge Tobacco Manure*	----	154	307	278
S	3000 Stockbridge Tobacco Manure 500 Stockbridge Tobacco Manure*	----	215	430	389
T	945 Dry Ground Fish 547 Nitrate of Soda 300 Lime	32.19	175	70	----
U	2200 Mapes' Tobacco Manure, Wrapper Brand 600 Mapes' Starter	----	138	232	291
V	2400 Mapes' Tobacco Manure, Wrapper Brand 400 Mapes' Starter	----	143	219	309
W	2400 Mapes' Tobacco Manure, Wrapper Brand	----	130	165	296
X	2000 Sanderson's Formula for Tobacco	----	99	156	122
Y	1579 Cotton Seed Meal 7290 Wood Ashes	55.27	105	214	340
Z	1134 Dry Ground Fish 1197 Double Sulphate of Potash and Magnesia 283 Cooper's Bone	41.74	105	159	340
AA	Stable Manure 10–12 cords†	----	111	71	149
BB	6000 Tobacco Stems 2894 Castor Pomace	63.71	239	74	517
CC	3000 Pinney's Formula Fertilizer	----	131	196	305

* Applied as a starter.

† Estimated to contain 111 lbs. nitrogen, 71 lbs. phosphoric acid and 149 lbs. potash.

PLANTING AND CARE DURING GROWTH.

The experience of previous years having showed that the plants were injured by contact with the fertilizers, if the latter were merely harrowed in, near setting time, in 1895 the fertilizers were plowed under, two weeks before the plants were set. The results were perfectly satisfactory. The plants started quickly, grew well and showed no signs of "burning" by contact with the fertilizers.

The plants were set with the Bemis planter on May 25th. Paris green was applied on the 27th, to check the ravages of the cut worm.

On June 3d, 2,000 plants were re-set.

On July 13th, about two thirds of the whole field was topped. On the 20th, all had been topped except plots T, Z and Y, which were backward in development. At this time the tobacco on plot AA was as large as any, but looked as if needing plant food. On the 25th, this plot of tobacco had begun to turn yellow. The crop was harvested on Aug. 14th and 15th.

NOTES ON THE RAINFALL, SOIL MOISTURE AND TEMPERATURE.

As in the season of 1893, through the coöperation of Prof. Milton Whitney, Chief of the Division of Agricultural Soils of the U. S. Department of Agriculture, who supplied the necessary instruments, daily observations were made by Mr. Adelbert DuBon during the growing season, of maximum and minimum air temperature (radiation thermometers), maximum and minimum soil temperatures (average to depth of nine inches), and rainfall.

The instruments were placed near the crop on a plot which was kept free from all vegetation.

Samples of soil to the depth of nine inches were also daily drawn by Mr. DuBon from several plots and sent to the Station for determination of moisture.

The sampling apparatus and method of packing the samples were designed by Prof. Whitney.

These observations taken together give a record of meteorological conditions which, however incomplete, is of great assistance in comparing the conditions under which the crops of successive years are raised.

RAIN-FALL IN 1895.

The tobacco was set on May 25th, and harvested on August 14th and 15th, and was in the field therefore 81 days. The rainfall during that time was as follows :

May 26	.22	July 1	.09	July 25	.10
“ 27	.66	“ 4	.50	“ 27	.51
June 3	.30	“ 5	.25	“ 30	.30
“ 6	.21	“ 6	1.10	Aug. 7	1.20
“ 25	.19	“ 9	1.37	“ 10	.06
“ 27	.25	“ 13	.74	“ 12	.25
“ 28	.48	“ 16	.35	“ 13	.09
“ 29	.10	“ 20	.06		

Total 9.38 inches.

The corresponding rain-fall in 1894 was 7.16 inches, in 1893 6.13, in 1892, 16.01.

On only nine days was the soil “too dry” in the opinion of the grower. In 1894, there were 15 such days. June was a dry month and no rain fell from the 6th to the 25th, but after this time more or less rain fell every week.

On the whole the season was more favorable for the crop as far as concerns rainfall than either 1893 or 1894.

THE PERCENTAGE OF WATER IN THE SOIL.

Daily determinations of moisture in the soil, taken to the depth of 8 inches, were made on three different plots of the field, as follows:—

Plot 1, after lying unfertilized and untilled for ten years, was plowed in 1894 and 1895, kept free from vegetation and the soil surface was occasionally stirred by raking.

Plots F and Y were planted with tobacco, the former dressed with 1670 lbs. to the acre of Linseed Meal, 536 of Cotton Hull Ashes and 277 lbs. of Cooper's Bone. Plot W was dressed with 2,400 pounds of Mapes' Tobacco Manure.

In the following table are given the average per cents of water found in the soils for each week, calculated from daily determinations.

AVERAGE MOISTURE IN TOBACCO SOIL.

		Plot bare of vegetation.	Plots planted to Tobacco.	
		A	F	Y
June 17 to	23	7.4	8.6	6.3
“ 24 “	30	8.5	9.8	7.8
July 1 “	7	8.5	9.9	9.1
“ 8 “	14	10.6	11.7	11.3
“ 15 “	21	8.6	9.7	8.8
“ 22 “	28	8.5	7.6	5.6
“ 29 “ Aug.	4	7.9	6.4	7.2
Aug. 5 “ “	11	8.2	8.3	6.8
“ 12 “ “	18	8.5	9.5	8.2
Average,		**8.5**	**9.1**	**7.9**

In 1895, the plot which was bare of vegetation contained on the average one per cent. more of moisture than in 1894. Plot F, for some unknown reason, in both seasons has held more moisture than most of the plots.

In 1894 the plots planted to tobacco contained considerably less water after the crop had reached its full development than earlier in the growing season. In 1895, on the contrary, the rainfall was such as to keep the water-content of the soil practically the same throughout the growing season.

TEMPERATURE OF AIR AND SOIL.

Daily observations of temperature were made, as already described, by Mr. Adelbert DuBon.

In the following table are given the average weekly maxima, minima and ranges of temperature.

AIR AND SOIL TEMPERATURE AT THE TOBACCO FIELD.

WEEKLY AVERAGES.

	Radiation thermometers.			Soil temperature.		
	Max.	Min.	Range.	Max.	Min.	Range.
June 18 to June 22	97	50	47	85	69	16
" 23 " " 29	87	60	28	84	65	19
" 30 " July 6	84	53	31	84	61	23
July 7 " " 13	83	52	31	87	60	27
" 14 " " 20	85	53	32	80	57	23
" 21 " " 27	92	53	39	93	70	23
" 28 " Aug. 3	84	49	35	86	60	26
Aug. 4 " " 10	93	56	37	94	69	25
" 11 " " 17	94	56	38	97	64	33
" 18 " " 22	84	49	35	92	59	33

The highest temperature recorded by the radiation thermometer was 102°, the lowest 41°.

The highest record of the soil thermometer was 101°, and the lowest 50°.

HARVESTING, CURING, STRIPPING AND SORTING.

The crop was harvested on Aug. 14 and 15. The weather was generally favorable for rapid and dry curing. There was no trace of pole-sweat in the tobacco, but some white vein. The crop cured too rapidly to get the best quality of wrapper leaf.

On Oct. 13th, the cured tobacco was taken from the poles and was stripped on the 14th and 15th.

Sorting was begun on the 7th of November and required about a week for its completion.

At each handling of the crop a representative of the Station was always present; all weights were made and recorded and samples drawn by him.

As the crops were sorted, samples were carefully drawn from each lot of long and short wrappers and labeled as described in the Report for 1893, p. 138.

These samples were for laboratory examinations and for fermentation.

The following table gives the results of the sorting. The weights are in pounds. For those unfamiliar with the details of sorting leaf-tobacco, it may be said that the "seconds" are the lower leaves on the stalk, smaller than those of either of the other grades, over-ripe and unfit for wrappers. The "long wrappers" and "short wrappers" are the most valuable part of the crop, the latter being smaller and lighter, and often cutting to greater advantage than "long wrappers." The "top leaves" are often as large as the long wrappers, but heavier, darker in color and unripe.

WEIGHTS OF THE BARN-CURED LEAVES FROM $\frac{1}{20}$ ACRE.

CROP OF 1895.

Plot.	Long Wrappers.	Short Wrappers.	Seconds.	Top Leaves.	Net weight of Sorted Tobacco.
A	41½	11	13½	17	83
B	39	12	10	20½	81½
C	47½	16½	11½	15½	91
D	58½	15	10	17	100½
E	50½	15	10½	17½	93½
F	32	11	14	21	78
G	42½	14½	15	17½	89½
H	59½	13	8½	17½	98½
I	65½	13	8	15	101½
J	63½	16	7½	19½	106½
K	41½	13½	12½	19	86½
L	32	12½	19½	23½	87½
M	32	12½	17	26½	88
N	42	15½	13½	17½	88½
O	42	15½	10½	17	85
P	37	16½	10½	16½	80½
Q	45	10	14½	22½	92
R	40½	12	10½	19	82
S	55½	11½	8	15½	90½
T	29	7	15½	39	90½

WEIGHTS OF THE BARN-CURED LEAVES FROM $\frac{1}{20}$ ACRE.

CROP OF 1895.

Plot.	Long Wrappers.	Short Wrappers.	Seconds.	Top Leaves.	Net weight of Sorted Tobacco.
U	48½	10½	14½	20	93½
V	39½	10½	13	14	77
W	42½	10½	9	13	74
X	50	10½	12	14	86½
Y	34½	13½	13	17½	78½
Z	35½	13	16	19½	84
AA	29	12½	19	18	78½
BB	62½	13½	8½	13	97½
CC	37	11½	13	19	80½

PER CENT. OF THE FOUR DIFFERENT GRADES.

POLE-CURED CROP OF 1895.

Plot.	Long Wrappers.	Short Wrappers.	Total per cent. of Wrappers.	Seconds.	Tops
A	51	13	64	16	20
B	48	15	63	12	25
C	52	18	70	12	18
D	57	15	72	10	18
E	54	16	70	11	19
F	41	14	55	18	27
G	47	16	63	17	20
H	60	13	73	8	19
I	64	13	77	8	15
J	60	15	75	7	18
K	47	16	63	14	23
L	36	14	50	22	28
M	36	14	50	20	30
N	48	17	65	15	20
O	50	18	68	12	20
P	46	20	66	13	21
Q	49	11	60	16	24
R	49	14	63	13	24
S	61	13	74	9	17
T	32	8	40	17	43
U	52	11	63	16	21
V	51	14	65	17	18
W	57	14	71	12	17
X	58	12	70	14	16
Y	44	17	61	16	23
Z	42	15	57	19	24
AA	37	16	53	24	23
BB	64	14	78	9	13
CC	46	14	60	16	24

COMPARATIVE FIRE-HOLDING CAPACITY.

POLE-CURED CROP, 1895.

The method of determining the fire-holding capacity is described in the Station Report for 1892, page 17, and the meaning of the figures in the following table is described on page 140 of the present Report.

Plot.	Long Wrappers.	Short Wrappers.	Calculated from the average of both.	Plot.	Long Wrappers.	Short Wrappers.	Calculated from the average of both.
A	491	267	347	P	348	189	246
B	254	393	319	Q	189	129	150
C	337	282	292	R	250	228	227
D	291	390	332	S	159	280	218
E	352	465	399	T	152	100	117
F	283	275	266	U	174	195	178
G	237	349	288	V	162	221	188
H	291	179	217	W	241	316	271
I	256	254	244	X	100	108	100
J	226	272	241	Y	582	343	426
K	156	287	220	Z	293	233	248
L	287	244	251	AA	365	308	318
M	183	243	208	BB	321	236	260
N	185	267	221	CC	191	233	205
O	324	403	353				

NUMBER OF POLE-CURED LEAVES TO THE POUND.

CROP OF 1895.

	Long Wrappers.	Short Wrappers.		Long Wrappers.	Short Wrappers.
A	57	78	P	65	83
B	53	78	Q	48	77
C	51	83	R	52	80
D	46	81	S	54	73
E	49	76	T	53	87
F	61	86	U	59	72
G	52	72	V	50	78
H	50	75	W	48	90
I	49	75	X	54	84
J	55	70	Y	59	87
K	54	85	Z	52	81
L	61	77	AA	63	70
M	57	69	BB	79	85
N	53	71	CC	58	81
O	62	82			

Discussion of the Results.

The following paragraphs note the chief features of the crops of 1895. No strict comparison of them will be attempted till the crop has been fermented in the case.

Net Weight of the Sorted Crops, 1895.—The weights of sorted tobacco per acre, per cent. of wrapper leaves and weights of wrappers in the crops of 1892 and following years are:

Years.	Weight of Sorted Tobacco.	Per cent. of Wrappers.	Weight of Wrappers.
1892	1845	66.7	1231
1893	1559	48.5	756
1894	1713	62.1	1064
1895	1754	64.1	1124

Plots J, I, D, H and BB gave the largest yield of tobacco, from 2130 to 1950 pounds per acre, and also the largest yield of wrapper leaves, 1590 to 1450 pounds.

Plots W, V, F, Y and AA, yielded less than any others, from 1480 to 1570 pounds of leaf. The smallest yield of wrappers, however, was on plots T, AA, F, L and M, from 720 to 890 pounds.

Cotton Seed Meal and Castor Pomace.—(Plots A, C, D, compared with E, G, H.)

Between the gross yield of cured leaf from the plots dressed with cotton seed meal, and from those dressed with castor pomace was a difference of 140 pounds in favor of castor pomace; the difference in yield of wrapper leaf was but 100 pounds.

The weight of 100 leaves from the plots dressed with cotton seed was a little less than the weight of the same number of leaves from the castor pomace. As far as can be judged at present, there was no significant difference in the crops raised with these two fertilizers.

Increasing the quantity of cotton seed meal or of castor pomace applied to the land, from 1580 to 3160 pounds in case of cotton seed meal, and from 2080 to 4170 in case of castor pomace, increased the total yield and the yield of wrapper leaves.

Linseed Meal.—Plots B and F compared with A. The yield on Plot B, which was dressed with linseed meal instead of the corresponding quantity of cotton seed meal, was smaller than on plot A by only 30 pounds of leaves. No other differences between the two are noted.

On plot F, where the potash supplied was but 150 pounds instead of 340 pounds per acre as on plot B, the yield of leaves was 100 pounds less, and of wrappers 210 pounds less than on plot A.

Nitrate of Soda with Castor Pomace.—Plots I and J compared with plot H. Where, for an application of 210 pounds of nitrogen in form of castor pomace as on plot H, was substituted one-half that quantity of nitrogen in form of castor pomace, and the other half in form of nitrate of soda, plots I and J, the total yield of leaf and the yield of wrapper leaf were increased by about 150 pounds.

Fish, Stable Manure and Tobacco Stems.—Plot T, which was dressed with fish and nitrate of soda without potash, gave a very small yield of wrappers, 720 pounds per acre, with a very small capacity for holding fire. Plot Z, dressed with fish and double sulphate of potash yielded 250 pounds more of wrappers per acre.

The yield of wrappers on plot AA, dressed with 10–12 loads of stable manure per acre, was small, 830 pounds, while plot BB, dressed with tobacco stems and castor pomace, yielded 1520 pounds of wrappers.

Plot AA during the growing season showed signs of lack of plant food.

Potash Salts.—Plots A, K, L, M, N, O, P, Y. The nitrogen and phosphoric acid supplied to these plots in fertilizers has been the same in kind and quantity for four years.

The largest gross yields in 1895 from this series of plots were on M, high grade sulphate of potash, and N, high grade sulphate with lime, and were respectively 1760 and 1770 pounds of leaves.

The yield of wrappers, however, on M was as low as any, 890 pounds per acre, and on N 1050.

The yields of leaves on plots P, carbonate of potash and magnesia, and on Y wood ashes, were smaller than on A, cotton hull ashes; the others in the series were larger.

Plot O, carbonate of potash, gave the highest yield of wrappers, 1150 pounds, and plot K, double sulphate of potash and magnesia, came next, 1100 pounds.

The fire-holding capacity of the tobacco raised with high-grade sulphate was least in the series, that raised with the low grade sulphate was next.

The number of pole-cured leaves required to make a pound was also least in the leaves raised with the last two named forms of potash.

THE NITROGEN AND MINERAL MATTERS IN A PEACH CROP.

BY E. H. JENKINS.

ANALYSES BY MESSRS. WINTON AND OGDEN.

A basket of peaches, raised at the Summit Orchard of Messrs. Platt and Barnes, West Cheshire, and bought in the New Haven market, has been examined at the Station laboratory.

The basket contained 151 peaches, which weighed 23.92 pounds,* or a little more than 2½ ounces† apiece.

2,000 grams of the fresh peaches were "stoned," sliced, air-dried and partially analyzed. The composition of the fruit was as follows, per cent. :—

Pulp or flesh, air-dry	11.85	containing nitrogen	1.35
		" ash	2.77
Stones or seeds, "	5.75	" nitrogen	.88
		" ash	.62
Water lost in air-drying	82.40		
	100.00		

Total nitrogen in air-dry fruit ....2.23 per cent.
" ash " " " ....3.39 " "

The ash of pulp and stones had the following composition :—

	Pulp.	Stones.
Sand and silica	6.38	5.26
Oxide of iron and alumina	.94	6.53
Lime	2.76	16.43
Magnesia	3.27	10.06
Potash	67.72	33.11
Soda	3.17	5.50
Phosphoric acid	11.60	18.92
Sulphuric acid	2.83	4.00
Chlorine	1.70	.21
	100.37	100.02
Oxygen equivalent of chlorine	.37	.02
	100.00	100.00

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* Equal to 10,850 grams.

† Equal to 72 grams.

When peach trees are set 18 feet apart each way, as is the common practice in this State, there are 130 trees to an acre.

Experienced growers reckon 3 baskets per tree, an average yield for orchards 5 years planted. Four baskets per tree is a maximum crop.

From the above data are calculated the quantities of nitrogen and mineral matters removed from an acre of 130 trees by the average crop of three baskets of peaches per tree, viz:

NITROGEN AND ASH-INGREDIENTS IN A PEACH CROP OF 390 BASKETS PER ACRE.

Nitrogen	19.7	pounds.
Potash	21.9	"
Soda	1.2	"
Lime	1.0	"
Magnesia	1.0	"
Oxide of iron	.4	"
Phosphoric acid	4.2	"
Sulphuric acid	1.0	"
Chlorine	.4	"

Contrary to the commonly received idea, the pulp of the fruit contains the greater part of both the nitrogen and mineral matters. Only about one-fourth of the nitrogen and one-tenth of the ash-elements are contained in the stones.

While these quantities of nitrogen and mineral matters are smaller than those removed by many other garden or field crops, it does not follow that peach trees need less care for their proper manuring.

The quantities of plant food required for the yearly growth of wood and leaves must be considerable. Young twigs contain a larger proportion of nitrogen, phosphoric acid and potash than old wood. But we have no exact data at hand from which to compute the yearly demand of the growing peach tree on the plant food in the soil.

Field experiments demonstrate that liberal fertilization is necessary to secure the most profitable returns from peach orchards.

ON FERTILIZING ORCHARDS.

BY S. W. JOHNSON.

The figures given in the foregoing paper, p. 158, simply show what is carried off from the acre of land by the crop of peaches and indicate that an annual return of 20 pounds of nitrogen, 22 of potash and 5 of phosphoric acid will restore to the land what the average peach crop requires, and that 27 lbs. of nitrogen, 30 of potash, and 7 of phosphoric acid will make good the deficit caused by a maximum crop, provided there are no other sources of loss besides the export of fruit. But it is one thing to return to the soil what the crop has removed and, to some extent, another thing to maintain the fertility of the soil so far as relates to the suitable supply of plant-food.

The active feeders of the tree in the soil are the young rootlets and root-hairs that are put forth the current year. The roots of five and two years ago are probably themselves totally incapable of feeding the plant. Even last year's roots are of little use except as they are a necessary basis of the new rootlets that develop this year. The young roots of each successive year of growth thus occupy different positions in the soil, and since most of the plant-food in the soil is incapable of movement, much of it, at any time, is out of the reach of the rootlets, and to be fertile the acre of soil must contain many pounds of plant-food in order to ensure to the crop the few pounds which the crop requires.

If the soil is very rich to begin with, the trees may produce well for years without fertilizers, but the New England hills which furnish our best orchard sites are now, as a rule, not fertile, and must be well enriched to make them profitable.

It is now, no doubt, well known to orchardists, that soils have the power of changing the solubility and availability of the plant-food which may be put upon them, in fertilizers. It is well-proved that phosphoric acid, applied in water-soluble form, shortly, in many soils within a few days or weeks, becomes quite insoluble in water, and for a considerable time gradually diminishes in availability. Certain soils contain enough phosphoric acid to serve many large crops if it were freely accessible to their roots, but that this phosphoric acid is not immediately available is demonstrated by the fact that moderate dressings of plain superphosphate strikingly increase the yield. What has just been stated of phosphoric acid is equally true of potash.

As to nitrogen, we know much but not nearly enough of its incomings and outgoings. We know that the soils of forests, meadows and moist pastures gain in nitrogen, while dry, naked or tilled ground loses nitrogen from year to year. We know that clovers and legumes generally, rapidly enrich or may enrich the soil they grow upon, as respects nitrogen, while the culture of cereals, root and fiber crops, and garden "truck," diminishes and exhausts the soil-nitrogen.

As a rule, in case of soils that have a fair proportion of fine, clayey matters, all the phosphoric acid and potash that may be needed to aid any crop, if once applied, cannot escape from the soil and will be retained near the surface, will not in any event descend much below or spread from where it has been placed. With nitrogen it is very different and loss of this element may occur in three ways: 1st, by leaching out, in the drainage-water, as nitrates; 2d, by escaping into the air, as nitrogen gas, and 3d, by conversion into comparatively inert forms, such as exist in leaf-mold, swamp-muck and peat (humus), or in the cell tissues of fungi and the shells or cases of insects (chitin).

For these reasons, soluble and active, and therefore costly fertilizers, are best applied in small doses, at or near the surface of the ground and at short intervals, while cheap, insoluble and slowly-acting manures may be used in large applications and deeply mixed in order to establish a more permanent state of fertility.

The amount of any needed fertilizer-element to be supplied annually, must be learned by experience or experiment, since soils vary greatly in their composition and qualities, and the supply must commonly be several or many times larger than the amount annually taken off in the crop.

One fertilizer-element that is scarcely noticeable in the export of the peach crop, is nevertheless important to its production. The chief ingredient of the ash of the wood, bark and leaves of all trees is generally lime. The wood of healthy peach twigs, of one year's growth, from the orchard of the late P. M. Augur, analyzed at this station (Annual Report, 1884, p. 93), contained 1.87 per cent. of ash, of which 54.2 per cent. was lime, 9.5 per cent. magnesia, 16.3 per cent. potash, 4.3 per cent. phosphoric acid and 6.9 per cent. sulphuric acid. The mature leaves of oak and chestnut trees contain, with about 30 per cent. of water, 3 to 4 per cent. of ash and of the latter 30–40 per cent. is lime. Where the water of wells or springs, coming from the soil, is soft or but slightly hard, the orchard needs lime to be supplied. This substance dissolves rather freely in the drainage water and is therefore subject to constant waste. In case of most Connecticut soils the natural supply of lime comes from rocks (boulders, gravel, sand and rock-dust) which contain but little and yield it up very slowly. For these reasons wood ashes or cheap lime should be broadcast at the rate of some 500 lbs. per acre, yearly.

If, as is becoming common, scarlet clover or other legume is sown to gather nitrogen, this dressing of lime and a liberal use of potash salts will probably be essential to the highest success.

THE BEST ECONOMY OF CONCENTRATED FERTILIZERS.

By S. W. Johnson.

All plants commonly cultivated in the field or garden require to their full and profitable development the coöperation of a number of *agencies* or forms of energy, of *substances* or kinds of matter and of *conditions* or circumstances of situation. These agencies, substances and conditions *must work together* in due quantities and proportions, and the absence or deficiency of any single one, as well as too much of any one, will injure, destroy or prevent a crop.

The *agencies required* are on the one hand the radiant energy that comes to us primarily from the sun, which we call light and heat, and on the other, the forces that reside in the matter of air, water, soil and fertilizers—forces which are named chemical affinity, cohesion, adhesion, etc.

To what extent electrical energy is involved in crop-production is as yet but little understood. Latterly the agencies of microscopic life in the soil have been found to have an importance that but a few years ago was not dreamed of.

The *needed substances* are those which essentially compose fertile soil, perfect plants and animals and useful manures, viz: oxygen gas and carbonic acid gas of the air, water of air and soil, sand, clay and humus (or decaying vegetable matter) of the soil, and the several forms of plant-food which the productive soil is the source of—sulphates, phosphates, nitrates, carbonates and muriates of potash, ammonia, lime, magnesia and iron.

Among the *requisite conditions* are certain alternations of heat and cold, of light and darkness, of dryness and wetness, due porosity and compactness of soil.

Many farmers who live on a fertile soil and under a genial sky, even in these latter days, gather in their abundant harvests with little thought or knowledge of these energies and substances. The sun, the rain, the soil, prepared for them in the beginning, have been the sufficient sources of everything needed for their crops.

But most of those who will read these lines do so because, what in the beginning answered well enough for them or for their forerunners has become insufficient and they are compelled to make inquiry: What is the reason that crops are poor, and what can be done to the land to restore and increase its productiveness?

The commercial fertilizer commonly supplies to the crop several substances which are indispensable to its make-up and which, therefore, are adapted to assist its growth, principally nitrogen, phosphoric acid and potash. With these, lime, magnesia, chlorine and sulphuric acid are frequently associated. The three substances first-named are also those which, in general, are most rare in the soil; which, therefore, are most quickly exhausted and most difficult and costly to restore.

When land is infertile, because it is deficient in one or more of the ingredients of commercial fertilizers, then the use of the latter is the certain and proper remedy, as experience on the part of thousands of farmers in Europe and America has thoroughly demonstrated.

But the commercial fertilizer does not, in most cases, fully restore what the crop removes, and as the land, by a long series of harvests, has once been reduced to a comparative infertility which the superphosphate or potash salt or nitrate has relieved, so it will in time, if cropped by their help alone, fail again because some substance or condition which they have not supplied has been exhausted or destroyed.

The solar energies that develop our crops are furnished, in the course of nature, in such plenitude as, we well understand, belongs to our climate and to the exposure and situation of our fields. We cannot increase the sunshine either in its duration or intensity. We can, however, more or less neutralize and nullify its good offices or fail to get the full measure of its benefits by leaving our originally wet fields water-soaked, or by permitting them to pass into a springy and stagnant condition. The heat of the sun, without which the soil is incapable of affording a genial rooting-place to our crops, cannot find its way downward to give due warmth to the earth unless there is free circulation of water in the soil, nor can the abundant oxygen of the air, without which no part of any plant can grow or live, be supplied to the roots of our crops unless the soil has a proper porosity and openness of texture established and maintained in it by judicious tillage and, it may be, by drainage or other amendment.

It is true enough, that in many instances a few hundred pounds of superphosphate or bone-dust, or sulphate of ammonia or a combination of them, has enabled a field to yield better harvests than could be got by a more costly application of stable or yard manure. This is plainly because the manure alone could not supply enough of nitrogen or of phosphoric acid or of potash for the crop. It is also true, that in many cases the commercial fertilizer which, for a few years, far outdid the stable manure, finally fails to perform the duty expected of it and the stable manure must be had recourse to and gives satisfaction, save in respect to the trouble and cost of getting it. This, again, is because the stable manure supplied something which the commercial fertilizer could not.

That "something" in some cases is a substance or kind of matter—it may be lime, which in the course of cropping is removed from the soil in larger quantity than commercial fertilizers supply, or potash, which is often wanting in superphosphates; but in most cases it is a "condition," a "texture" of the soil which is not easy to describe, but which in the dunged land is recognized as a mellowness and moistness that is lacking in the land not dunged.

The garden of the Connecticut Agricultural Experiment Station is a coarse, sandy loam, which with moderate dressings of decaying vegetable matter in shape of stable manure has the texture, feel and look of good land and gives good crops, but without a supply of humus soon becomes harsh and "worn out."

A little of the spongy matter of dead and rotting manure, a little of the gelatinous "Geine" of the author of the "Muck Manual," gives to soil a quality which enables the earth to serve as an efficient regulator of the heat and moisture that have or should have access to it.

Reference has been made to the fact that lime is supplied to the land in small quantity by superphosphates. It may be added that they furnish lime mostly as phosphate or sulphate. The well authenticated result of experience, in British agriculture, some forty years ago, that "lime had reclaimed more poor land than all other fertilizers put together," is a practically acquired fact, demonstrating that application of carbonate of lime (or quicklime which rapidly becomes carbonate) in many cases makes land fertile by supplying one or several "conditions" favorable to crops. We have of late years learned in what some of these conditions consist. We know that when muriate of potash and sulphate of ammonia are given to growing crops the potash and ammonia are appropriated by the plant while the muriatic acid and sulphuric acid are left in the soil. Now that they shall not accumulate in such quantity as to injure vegetation it is essential that the soil contain some substance, itself harmless, which shall take up and neutralize the liberated acids. Carbonate of lime is one of the best materials for this purpose and on the soil of regions where lime is naturally deficient (which is the case where well- and spring-waters are "soft") the farmer should lose no good opportunity to add moderate quantities of carbonate of lime to those of his fields upon which he has made or intends making extensive use of potash or ammonia salts, or of fertilizers containing them.

Again, we understand that the conversion of refuse vegetable and animal matters—such as stable-manure, leaf-mold, the stubble of crops, dried blood, tankage, hair and wool waste and the organic matter of bone—into plant-food, requires the intervention of chemical agencies which shall transform their inert nitrogen into ammonia-salts or nitrates. The natural forces that do this work, and do it most cheaply and beneficially, are those of the microbes (small life) which the most powerful microscopes just enable us to see, organisms that feed upon these refuse matters in the soil. The nitrifying microbe, which changes agriculturally inert nitrogen into nitrates, cannot perform its work in a soil where any considerable amount of free acid other than carbonic acid exists, but works well and multiplies in presence of a little carbonate of lime.

Space is wanting here to go further into this subject and my purpose is simply to illustrate the fact that the interests of those who buy as well as of those who sell commercial fertilizers can be best promoted by a knowledge, well applied, of all the factors of crop-production; that the plant, like the man, to flourish, not only requires an abundant and varied bill of fare, but also a suitable lodging and the comforts of a well-appointed home; that the best economy of commercial fertilizers is to be attained by intelligently investigating what special wants of the soil or crop their various grades are adapted to meet, and what further wants of soil or crop must be attended to in order to prevent that impoverishment of land and landholder which otherwise, sooner or later, is likely to ensue—the experience of which has led many agriculturalists to the erroneous conclusion that concentrated fertilizers are "stimulants and not nourishment," and that they "exhaust the soil," whereas they merely aid the farmer to exhaust the soil by rapidly removing, in the crops, substances which the soil unaided can supply but slowly or insufficiently and by impairing or destroying one or several of those conditions which are indispensable to plant-production.

FURTHER EXPERIMENTS ON THE PREVENTION OF POTATO-SCAB.

By Wm. C. Sturgis.

The results of the experiments conducted at South Manchester during the summer of 1894 clearly demonstrated the value of treating "seed"-potatoes with corrosive sublimate. Incidentally the results indicated the value of certain minor precautions. The use of clean seed, that is, seed free from scab, is to be strongly recommended, inasmuch as the amount of scab on the crop was found to be directly proportional to the amount of scab on the seed. There was strong evidence that the use of barnyard manure tends to increase the amount of scab on the crop, other things being equal, an effect which cannot be entirely counteracted by the corrosive sublimate treatment. These results harmonized with those obtained by other observers, and seemed conclusive as far as they went. One very important factor however, was disregarded in the experiments. The land itself was free from the germs of the scab-fungus, having been in grass for a number of years, and having never probably borne a root crop; the freedom from scab which resulted from the planting of clean seed, treated before planting with corrosive sublimate, might very probably therefore have been due in a measure to the fact that there was no source of infection in the soil. It is usually either impossible or impracticable to secure such a soil-condition on the farm, and it was therefore necessary to repeat the experiment under the conditions obtaining in general farm practice. The previous experiment had brought about the required condition. The smallest percentage of scabby potatoes obtained from any one plot in 1894 was 16 per cent. on plot H. The other plots yielded from 23 to 84 per cent. of scabby potatoes. At the close of the experiment therefore, the whole piece was infested with the scab-fungus in various degrees, and the percentage of scabby potatoes obtained respectively from each plot served as a basis for determining in a general way the comparative quantity of the scab-fungus in the soil of that particular plot. Thus it was not only known that the land contained the germs of the disease, but it was also possible to estimate roughly to what extent this condition might be expected to affect the coming crop on any particular portion of the field. In order to have a basis of comparison between potatoes grown on land infested with scab and on land free from scab, a new piece immediately adjoining the old was ploughed under in the autumn and prepared for planting; this land was practically free from scab except where it joined the old piece. Here it was doubtless contaminated, as the whole piece, including the new land, was ploughed and harrowed in the spring in a direction at right angles to the former rows.

In 1893 and 1894, the Rhode Island Station undertook a series of experiments with the view of ascertaining the effect of lime in increasing or diminishing scab upon potatoes.* These experiments are interpreted as showing that air-slaked lime tends to increase the scab of potatoes if applied to land which is naturally acid, this action being attributed to the production by the lime of a neutral in place of an acid condition of the soil, and the fact that the scab-fungus thrives best in a medium which is neither strongly acid nor strongly alkaline. Inasmuch as it had been generally supposed that lime, wood-ashes, or other alkaline substances always tended to increase scab, no matter what the soil-conditions, the results obtained in Rhode Island are valuable, and it seemed advisable to include in our experiment at South Manchester some inquiry into the matter. It should be borne in mind however, that the Rhode Island soils are said to be very acid, while that of our experimental field is not considered "sour."

Finally, information was desired upon the effect of barn-yard manure as regards the prevalence of scab. To obtain this, another piece of new land immediately adjoining the old was prepared and heavily manured.

The subjoined plan (Table I, p. 168) shows the divisions of the field at the beginning of the experiments. The portion enclosed by solid lines represents the land used in the experiments of 1894, the broken lines indicate the new land used for the first time in 1895. The limits of plots A–H were the same in both experiments; the numbers of rows in each plot are given on the plan, the rows being numbered consecutively from A; and the estimated percentage of scab in each plot is also shown.

For the experiment of 1895, the whole field, including the new land, received an ordinary dressing of commercial fertilizer.† To

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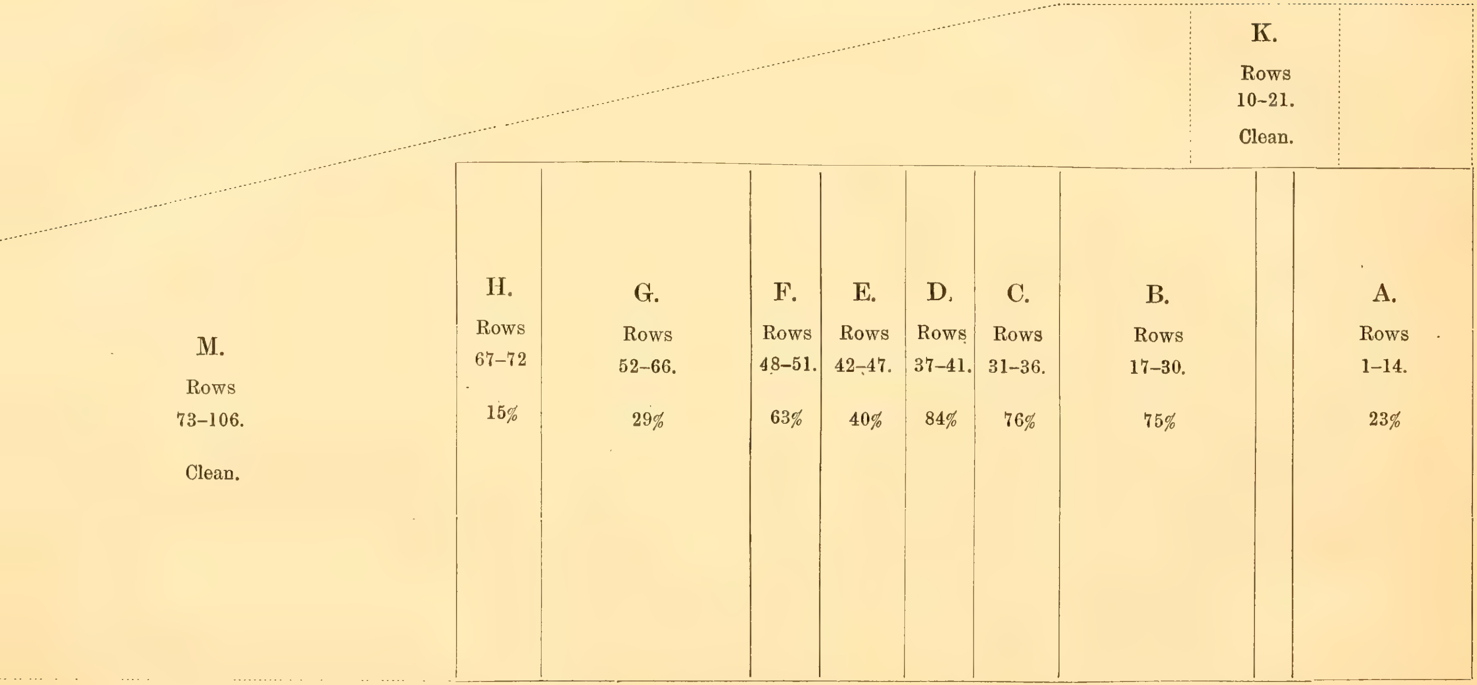
* R. I. Agr. Exp. Sta., Bull. 26, Nov. 1893; and Bull. 30, Nov. 1894.

†Applied at a rate to the acre of 1200 lbs. cotton-seed meal, 300 lbs. muriate of potash, and 500 lbs. dissolved South Carolina rock.

TABLE I.—PLAN OF EXPERIMENTAL FIELD OF POTATOES AT SOUTH MANCHESTER, CONN.



test the effect of lime, plot A was divided into two portions, one of which received a top-dressing of air-slaked lime with the fertilizer at the rate of one-half ton to the acre, while the other received no lime. A portion of each of these two half-plots was planted with treated seed, and the other with untreated. The seed-potatoes used throughout the whole experiment were clean.

Between A and B were planted two rows of seed which had been sprouted in order to test the effect of corrosive sublimate on the vitality of the sprouts. The latter were from one to three inches long at the time of planting. Plots B, D, F, G and H were planted with treated seed, i. e., with seed which had been soaked one and one-half hours in a solution of two and a quarter ounces of corrosive sublimate (bi-chloride of mercury) in fifteen gallons of water, then cut and planted as usual. Plots C and E were planted with seed not so treated, but in every other regard the same. The greater part of plot M was planted with treated seed, but a few rows received untreated seed for purposes of comparison.

Finally, plot K was divided into two parts of six rows each. One of these received fresh barn-yard manure, the other well-rotted compost from the same source. Each of these materials was applied in two different ways—in direct contact with the seed, and separated from the seed by a layer of soil. Plot K therefore, comprised four sub-plots illustrating the effect of (1) raw manure in direct contact with the seed, (2) raw manure not in contact with the seed, (3) composted manure in contact with the seed, and (4) composted manure not in contact with the seed. In order that any results which were obtained might be reasonably attributed to the presence of the manure or to the method of its application, the seed used on plot K was selected for its freedom from scab, the land was clean, and the seed received no preventive treatment.

From the plots so arranged and treated, information was expected on the following points :

1. The effect of lime on the prevalence of scab in a fairly neutral soil infested with scab and planted with clean seed, both treated with corrosive sublimate and untreated. (Plot A.)

2. The effect of corrosive sublimate on the vitality of sprouted seed-potatoes. (Two rows between plots A and B.)

3. The effect of treating seed-potatoes with corrosive sublimate in preventing scab upon land infected by a previous crop of scabby potatoes. (Plots B–G.)

4. The effect of the same upon clean land. (Plot M.)

5. The effect of barn-yard manure, both fresh and composted, in inducing scab upon potatoes grown from clean seed on clean land.

A few words may be of interest regarding the conditions of growth. The potatoes were all planted May 17th and 18th, and by June 15th were making fine growth. The plants from the sprouted seed were about a week in advance of the others, and maintained their advantage throughout, although those fertilized with fresh manure were not far behind them. From June 6th to June 20th the weather was exceptionally dry, but abundant rains had fallen previously and the vines received no serious check from drought during the season. They were all thoroughly sprayed with Bordeaux mixture on July 19th, but blight appeared notwithstanding, and by the beginning of August its effects had become very serious. A second application of Bordeaux mixture on August 12th failed to check the blight. As far as the experiment was concerned however, there was no serious injury, as all the experimental rows with one exception were planted with the variety New Queen, which proved remarkably resistant to the blight. The other varieties, Polaris, Woodbury White, and Early Rose proved very susceptible, and by the middle of August were half dead. All of the potatoes were dug Oct. 9th.

As in the experiment of last year, one or more sample rows were taken from each plot, the tubers were cleaned and separated with the greatest care into three grades according to the amount of scab visible upon them, grade I including tubers free from scab, grade II tubers fairly scabby but marketable, and grade III tubers rendered unmarketable by scab. After sorting, the product in each grade was weighed, measured, and photographed. The same process was applied to the sample yield from each plot.

Referring now to Table II, p. 171, we see that, leaving out of consideration for the present the treatment of the seed, the use of lime has increased the percentage of scab. The two rows which received lime show an average of over 34 per cent. of scabby potatoes, while those which received no lime show somewhat less than 21 per cent.

The results following the treatment of the seed on plot A are not without interest. The difference between the percentage of

TABLE II.—RESULTS OF EXPERIMENTS ON POTATOES AT SOUTH MANCHESTER, CONN.

Plot.	Sample row.	Fertilizer.	Scab in land.*	Treatment of Seed.	Weight of Crop.	Quality of Crop.	Total Per Cent. of Scab.
A^1	No. 3	Commercial with Lime	23%	Corrosive Sublimate.	111 lbs.	1. 77 lbs. = 69% 2. 29 " = 26% 3. 5 " = 4.5%	30.5%
A^2	No. 5	Commercial with Lime	23%	0	106 lbs.	1. 66 lbs. = 62% 2. 36 " = 34% 3. 4 " = 4%	38%
A^3	No. 11	Commercial without Lime	23%	Corrosive Sublimate	102.5 lbs	1. 78 lbs. = 76% 2. 22.5 " = 22% 3. 2 " = 2%	24%
A^4	No. 13	Commercial without Lime	23%	0	92 lbs.	1. 75.5 lbs. = 82% 2. 14.5 " = 16% 3. 2 " = 2%	18%
Sprouted seed	No. 15	Commercial	49%	Corrosive Sublimate	124 lbs.	1. 90 lbs. = 76% 2. 32.5 " = 26% 3. 2 " = 2%	28%
D & G	Nos. 39 & 60	Commercial	56%	Corrosive Sublimate	191 lbs.	1. 122.5 lbs. = 64% 2. 65.5 " = 34% 3. 3 " = 2%	36%
C & E	Nos. 32 & 45	Commercial	58%	0	233.5 lbs.	1. 133 lbs. = 57% 2. 92.5 " = 39.6% 3. 8 " = 3.4%	43%
M^1	No. 76	Commercial	0	Corrosive Sublimate	88 lbs.	1. 72 lbs. = 82% 2. 16 " = 18% 3. 0 " = 0	18%
M^2	No. 78	Commercial	0	0	107.5 lbs.	1. 81.5 lbs. = 75.8% 2. 25 " = 23.2% 3. 1 " = .9%	24.1%
K^1	Nos. 10–15	Barnyard manure (Composted)	0	0	297.5 lbs.	1. 173 lbs. = 58.2% 2. 91.5 " = 30.7% 3. 33 " = 11.1%	41.8%
K^2	Nos. 16–21	Barnyard manure (Fresh)	0	0	226.5 lbs.	1. 189.5 lbs. = 83.7% 2. 31 " = 13.7% 3. 6 " = 2.6%	16.3%

* Comparative estimate of scab-infection based on per cent. of scabby potatoes in crop of 1894, see page 166.

scab in rows 3 and 11, the seed for which was treated, and rows 5 and 13, which were not treated, is hardly appreciable. In fact all the plots occupying the infested land show similar results. In no case is the showing so markedly favorable to the treatment as in the experiments of 1894, where all the land was clean and the scabby seed served as the only means of infection. The conclusion seems inevitable that the prevalence of potato-scab is largely due to the prevalence of the germs in the soil, and under these conditions the treatment of the seed with corrosive sublimate loses much of its efficacy. Such a conclusion was to be expected. When the germs of the fungus are largely confined to the seed-potato itself, any treatment which will kill all or most of the germs will tend to produce a clean crop if the growing tubers are not infected from the soil or the manure. If, on the other hand, the germs exist throughout the soil, it is inconceivable to suppose that tubers formed even a few inches from the seed would be materially affected by any substance applied to the seed. The uniform results of these experiments tend to confirm the impression that potatoes, even if previously subjected to a disinfecting treatment, should not be planted on land infested with the scab-fungus. For the purpose of testing the effect of corrosive sublimate on the vitality of sprouted seed-potatoes, two rows between plots A and B were selected. The seed-potatoes were spread out in a warm, light attic, where they readily sprouted, producing slender shoots from one to three inches in length. For practical purposes it would have been better to have sprouted the seed under conditions of warmth and sunlight, which would have produced a short and stocky growth. The comparatively long shoots are very delicate and are liable to become broken off in the necessary handling. The sprouted potatoes enclosed in a sack were immersed for one and one-half hours in the corrosive sublimate solution, then dried, cut, and planted, and by exercising care in handling, very few of the sprouts were lost. That the sprouts were uninjured by the treatment was indicated by their fresh and sound appearance an hour or more after the potatoes were removed from the solution, and by the fact already mentioned that throughout their period of growth they were a week in advance of potatoes planted in the ordinary way. A comparison of the yields is also interesting. The yield from one row of sprouted seed 105 feet long, amounted to 124½ lbs.; that from an average row of the same length, of unsprouted seed, amounted to 102½ lbs. The difference is over one-third of a bushel. Upon an acre, the increased yield would amount to about fifty-one bushels, an item certainly worth considering. As regards the effect of the treatment upon the scab, the only row with which the sprouted potatoes can be fairly compared is row 13. The comparison shows an advantage of ten per cent. in favor of the treatment, notwithstanding the fact that the land occupied by the sprouted potatoes presumably contained more than double the percentage of the scab-fungus. These figures however, regarding the scabbiness of the soil on the various plots are not to be considered as more than a rough appraisal, since even if we allow that the percentage of scab upon matured potatoes is a fair estimate of the percentage of germs remaining in the soil, many factors such as drainage, cross-cultivation, etc., tend to produce uniformity of soil conditions in adjacent plots. The figures are of value merely as an indication of the more or the less scabby condition of the soil in the respective plots.

For obtaining results on the third point—the effect of the treatment in preventing scab upon infested land—it was necessary to take two rows of treated seed and the same of untreated seed in order that the soil conditions might be as nearly as possible identical so far at least as the prevalence of scab was concerned. Plots D and G combined showed an average of 56 per cent.; the product of one row from each of these plots might therefore be justly compared with that of one row from each of the plots C and E, which together averaged 58 per cent. Although the percentage of scab upon the crop in both of these cases is very high (36 and 43 per cent.), the difference between them of 7 per cent. is in favor of the treatment, and the percentage of very scabby potatoes, though small in both cases, is almost twice as large in the untreated as in the treated rows. Furthermore, if we compare the quality of the crop from rows 39 and 60 on the one hand, and from row 76 on the other, the result of planting potatoes upon scabby land is rendered still more apparent. Although the seed in both instances was clean, was subjected to the same preventive treatment, and received the same application of commercial fertilizer, the gain in favor of the clean land amounts to more than 17 per cent. It will also be noted that the seed on the clean land of plot M, when treated, produced no very scabby potatoes, and it is doubtful if 5 per cent. of the tubers classed as grade II would have exhibited any trace of scab except to the eye of an expert.

We may feel assured that, so far as it goes, there is abundant evidence that land infested with scab will produce a scabby crop even when every other condition favors a clean crop, and the seed has been treated thoroughly with corrosive sublimate. The treatment however, does tend in a definite though small degree, to diminish the percentage of scab upon tubers grown on slightly infested land.

The effect of the treatment upon potatoes planted on clean land is illustrated by rows 76 and 78, both being included in the new plot M. This matter was dwelt upon at length in our Report for 1894, and owing to the undoubted infection of plot M from the adjacent plot, the results are not sufficiently reliable or striking to merit further notice.

Finally, we may consider the effect of the barnyard manure. The question is important since the evidence of the experiments of 1894 in this direction has by some been considered inconclusive, and because many inquiries have been addressed to the Station regarding the effect, in this connection, of barnyard manure in different stages of decomposition. To test this matter, a piece of clean land on the west border of the original field was prepared.* Clean seed, which had received no treatment, was planted in twelve rows, each 33 feet long, continuous respectively with rows 10–21 of the old piece. The plot is represented by the division marked K on the field-plan. The use of clean seed and clean land secured conditions of practical immunity to the crop, except from germs conveyed to the land with the fertilizer. In six of the furrows, barnyard manure, freshly dropped and mixed with a small amount of litter, was used as a fertilizer; in the remaining six rows, manure from the same source, but composted for a year, was used. Each of these lots of six rows was divided into two smaller lots of three rows each, in one of which the seed was placed in immediate contact with the manure, both above and below, and in the other was separated from the manure by a layer of soil. This difference in the method of applying the manure exerted no appreciable influence upon the growth of the plants or the prevalence of scab, and in tabulating the results the condition of the manure itself was alone considered.

As has been said before, the plants on plot K were in advance of those on the remainder of the field, with the exception of those from sprouted seed, and they maintained this advantage throughout the season. The tops made a very remarkable growth, and remained green for some time after those of the same variety (New Queen) on the rest of the field were practically dead. The yield exceeded that from the old piece by an amount equivalent to about sixty bushels to the acre. It must be remembered however, that plot K received a heavy application of manure in addition to the commercial fertilizer applied to the whole field, including plot K; this may be sufficient to account for the increased vigor of the plants and the proportional increase of the yield.

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*This new piece received an application of commercial fertilizer in common with the old piece, at the same time, and in the same proportions.

But a matter of more importance at present is the effect of the composted manure as compared with the fresh, in inducing a scabby condition of the crop. The results show that the use of composted manure as compared with fresh manure has increased the amount of scabby potatoes by 25.5 per cent., and if we consider the very scabby tubers only, the difference is still more marked. It is impossible at present to account satisfactorily for this result, and with only the results of this experiment at hand it would be unwise to conclude hastily that fresh manure is always less liable to induce scab than manure which has been composted for a year or more. Many factors enter into the consideration of such a question. Manure from the same barnyard may show differences within a twelve-month as regards its scab-inducing quality; the feeding of scabby potatoes to live-stock might produce a manure which would insure the prevalence of scab on any land to which it was applied, while a change of feed a few months later might render manure from the same source entirely harmless. It is unwise to speculate upon the results of a single experiment. Should future experiments prove what in this instance has been indicated, i. e. that composted manure has a greater inherent tendency to favor the development of potato-scab than manure freshly dropped, the fact will be one of importance in cases where it would be more practicable to draw the manure directly from the barnyard to the field than to compost it and hold it over for one season.

SUMMARY.

The experiments of 1895 upon the prevention of potato-scab indicate the following points:

1. That the addition of lime in small quantities to the soil of our experimental field, increased the amount of scab upon the potatoes. We are not prepared at present to offer any explanation of this fact.
2. That the presence in the soil of the germs of the scab-fungus tends so markedly to infect the coming crop that it is highly inadvisable to plant such land with potatoes, beets, or turnips.
3. That in case the soil is infested with the germs of the scab-fungus, the treatment of the seed with corrosive sublimate is of but little avail in preventing scab upon the crop.
4. That fresh barnyard manure exhibits less tendency to induce scab than composted manure. It cannot be too strongly emphasized however, that great stress must not be laid upon the result of our single experiment, since practically nothing was known regarding the infectious character of the particular manure used.

We hope to continue these experiments another year.

TRANSPLANTING, AS A PREVENTIVE OF SMUT UPON ONIONS.

By Wm. C. Sturgis.

There is no doubt that of the various fungous troubles of onions, the one known as "smut" and caused by the fungus *Urocystis Cepulæ* is by far the most serious. The rapid spread and disastrous nature of its attacks, the remarkable vitality of the germs or *spores*, and the persistence of the fungus in soil once infested with it, have combined to render worthless for onion culture many tracts of land in this State which formerly produced large crops. The fungus, its life-history, and its effects upon onions, have been ably discussed by Thaxter*, and for details the reader is referred to his work. Two methods of raising onions have long been practiced by Connecticut growers; one directly from seed, the other from small onions of the previous year's growth called "sets." As long as onion-smut has been recognized as a serious disease, it has been observed that onions raised from sets remain free from the disease even upon fields where onions raised from seed always suffer more or less seriously. Thaxter first suggested a sufficient reason for this fact, and proved his point by an ingenious experiment. He demonstrated that the smut fungus enters the onion seedling only while the latter is beneath the surface of the ground, so that if growth starts above ground, as in the case of sets, the plants are not affected with smut. The fact of the immunity, for the same reason, of transplanted seedlings was mentioned by Thaxter in this connection, but so far as I know the matter has received no practical demonstration. The method of growing onions by starting the seed in hot-beds, and transplanting the seedlings to the field, was suggested in 1891 by Mr. T. Greiner of La Salle, N. Y., and has since been practiced by him and by others with marked success. Several of the Experiment Stations also have tried this method. But all of these experiments have had for their object increase in the size and value of the onion crop. As far as that was concerned they were successful in proving that larger yields are obtained at no greater expense, and that the onions are larger and mature earlier than onions grown from seed sown in the open. But it seemed more than likely that this method would have another important advantage in producing a sound crop of onions even upon smutty land. Through the generous coöperation of Messrs. C. Buckingham and N. H. Sherwood of Southport, there was placed at the disposal of the Station a piece of land known to be infested with smut. The variety selected for the test was Wethersfield Red, and on March 6th the seed was sown in flats in Mr. Sherwood's greenhouse. Early in May the land was carefully prepared, and on the 8th of the month seed of the same variety and from the same package as that sown in flats, was sown in drills one foot apart, in the field. This could have been done earlier with profit, and the crop would doubtless have made a better showing. Between every two rows of seed, a space 3 ft. wide was left for the reception of two rows of seedlings. The latter were lifted from the flats on May 13th, and at once transplanted to the vacant rows. At this time the seedlings were half as thick as a lead-pencil and about 5 in. high. The soil was extremely dry, and a hot sun caused the plants to wilt badly, but they were watered that same evening and in a few days had recovered and were making a good growth. The plants were set in holes three inches apart, made by means of a narrow board set with wooden pins and pressed down with the foot. As fast as the holes were made, a man followed with the seedlings, dropping one in each hole and pressing the earth about it. The pins were of such a length that when the plants were set, the bulbs were about half an inch below the surface of the ground. From this time on the whole piece received the same treatment, being cultivated and weeded as usual. The transplanted rows however, required one less weeding than the rows from seed, and of course did not require thinning.

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* Annual Report of this Station for 1889, pp. 127–153.

All of the onions were harvested on September 4th. There were 20 rows grown by each method, each row being 26 ft. long. The onions were carefully examined as they were pulled, and all smutty plants and scallions were put on one side. It was then found that about 10 per cent. of the onions from seed were smutty, and fully 15 per cent. were scallions. Had the onions been thinned, the percentage of scallions would doubtless have been smaller; but on the other hand, there was abundant evidence throughout the rows, that many of the plants had been affected with smut so early that they failed to grow, the places where they had been being marked by scanty, smutted remains of leaves and bulb-scales. The 10 per cent. of smutted onions mentioned above includes only those which reached a fair degree of maturity. The contrast on the transplanted rows was very striking. Not a single plant showed any trace of smut; less than 1 per cent. of the seedlings had failed to reach maturity, notwithstanding the fact that they were very small when transplanted and were subjected to a period of very dry weather immediately after being set; and only a trifle over 1 per cent. of the plants were scallions. (See Table III, p. 179).

It seems fair to conclude therefore, that by raising seedlings in flats, and transplanting to the open ground, a clean crop of onions can be grown even upon land thoroughly infested with smut. I am not yet prepared to recommend this method for adoption on a very large scale, though by many it is contended that the increased yield, larger bulbs, and less labor incident to weeding and thinning, more than compensate for the added labor and expense involved in raising the seedlings under glass and transplanting. I am convinced however, that under certain circumstances this method would be highly profitable. As will be shown presently the yield is greater, the bulbs are larger and more perfect, and the crop matures earlier, by the transplanting method than by sowing

TABLE III.—RESULTS OF EXPERIMENTS ON ONIONS AT SOUTHPORT AND AT THE EXPERIMENT STATION.

EXPERIMENT AT SOUTHPORT.

Plot 39 ft. x 26 ft.

	Weight.	Quantity.	Av. Circumference.	Per cent. Smutted.	Per cent. Scallions and Missing.	Remarks.
20 rows Transplanted.	387 lbs.	6 bu. 1 pk.	8.24 in.	0	2%	
20 rows Seed.	212 lbs.	3 bu. $2\frac{1}{5}$ pks.	4.98 in.	10%	15%	The actual percentage of smutted onions on these rows was much larger than appears, since many of the plants were completely destroyed. See p. 178.

EXPERIMENT AT STATION.

Plot 29 ft. x 10 ft.

	Weight.	Quantity.	Av. Circumference.	Per cent. Smutted.	Per cent. Scallions and Missing.	Remarks.
14 rows Transplanted	81 lbs. 8 oz.	$7\frac{1}{2}$ pks.	6.8 in.		5%	The soil on this plot was poor and ill-adapted to onions; all of the bulbs were consequently small.
7 rows. Seed Thinned.	4 lbs. 15 oz.	$\frac{1}{2}$ pk.	3.4 in.		40%	Most of the loss on the 14 seeded rows was caused by cut-worms. The transplanted rows were practically untouched by worms.
7 rows. Seed Not Thinned.	11 lbs. 2 oz.	1 pk.	2.8 in.		40%	

in the open; the former method therefore, will be of advantage where an acre or less is to be planted with onions for home consumption or for small sales. This method presents the advantage over sets that, whereas the labor and expense is practically the same in both cases, the transplanting method produces mature bulbs in the course of one season with only the initial expense of sash for the hot-bed. Transplanting might therefore, with increasing profit, supersede the use of sets. Finally, if for any reason it becomes necessary for a grower to use smutty land for onions, or if smut has recently made its appearance in a piece of onion land, the land so infested can be set with seedlings which will produce a clean crop, thus not only making smutty land once more available for onions, but lessening the danger of spreading the disease.

Although considerations regarding the comparative value of different methods of cultivation are rather horticultural than mycological, it seems advisable to note certain facts which this and other similar experiments have made apparent.

The general opinion seems to be that the large foreign varieties of onions show a greater gain from transplanting than the native varieties which are mainly used in Connecticut. It is not unusual for such varieties as White Tripoli, Rocca, Pompeii and White Victoria to show a gain of from 100 per cent. to 300 per cent. by this method of growing; Mr. Greiner's striking results were secured with the variety known as Prizetaker, grown from American seed. In the experiment at Southport, as well as one undertaken simultaneously at this Station, Wethersfield Red was used, the object being to make the test with a variety very largely grown in this State. When the onions were harvested the total weight and bulk of the crop from seed and of that from transplanted seedlings was ascertained; fifty bulbs selected at random from each were then measured to find the average circumference, and finally ten of the largest bulbs in each lot were selected for photographing. Plate I, Fig. 1, shows the comparative size of the bulbs. One-half of the seeded rows at the Station were thinned out when the plants were about eight inches high, so that the remaining plants were about three inches apart, thus corresponding to the transplanted seedlings. The smaller size of the bulbs grown at the Station was due to the fact that the soil was not well suited to onions.

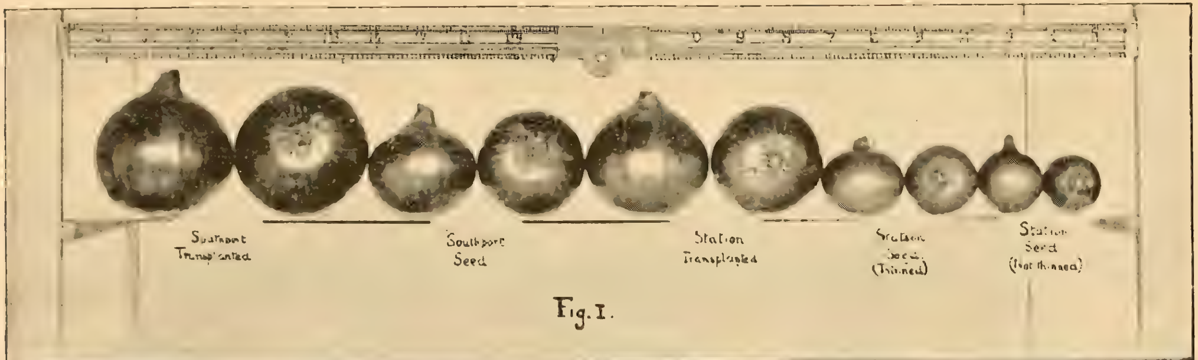

Fig. I.

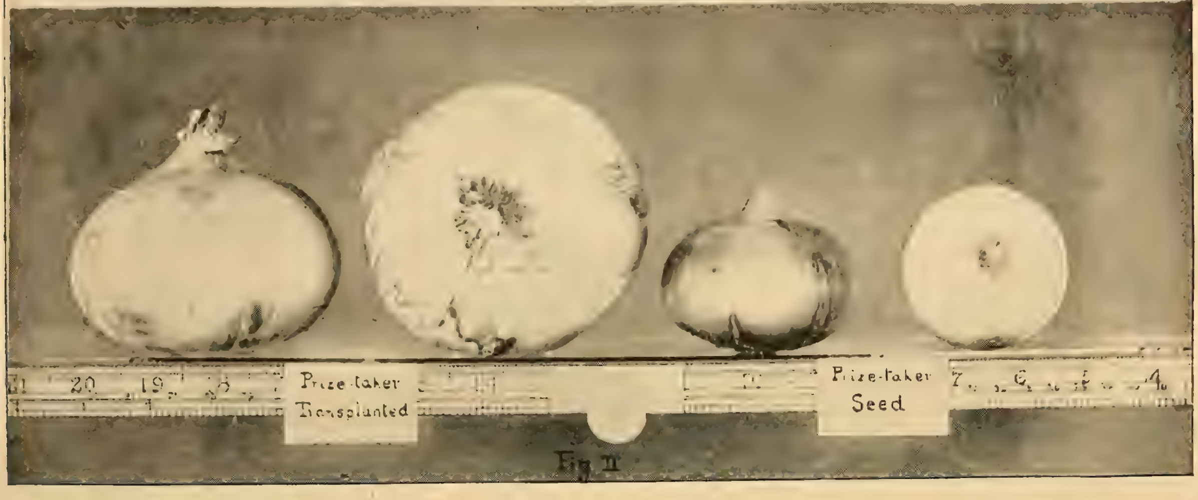

Fig. II

PLATE I. COMPARATIVE TESTS WITH ONIONS.

Table III, p. 179, gives the results as regards the yield and the quality of the crop. It will be seen that in the Southport experiment there was a gain in favor of the transplanted onions of 81 per cent. in weight, and of 65 per cent. in the average size of the bulbs. The advantage of transplanting to avoid smut has already been commented on.

The results obtained at the Station exhibit still greater contrasts; in fact the crop obtained from seed was fit for nothing but pickling, whereas the transplanted seedlings gave a full yield of fair-sized bulbs. When the plants from seed were about three inches high they were attacked by cut-worms. It was impossible to determine accurately the damage from this cause, but a moderate estimate would place the loss at 25 per cent.; these were counted as "missing." On the transplanted rows the onions were almost a month in advance of the others and practically escaped injury. The advantage gained by thinning out the seed-rows was only what might have been expected.

After the completion of these experiments it was learned that Mr. L. C. Beecher, of Woodbridge, had tried the same method, and through Mr. Beecher's kindness I am enabled to publish his results. These are of the greater interest in that the seed used was of the variety Prizetaker, so highly recommended for transplanting.

The seed was sown in flats about March 20th and transplanted on May 14th. Two drills were made, each 25 feet long; the fertilizer was sown in them, and as the soil and weather were very dry the soil in the drills was thoroughly watered. The seedlings were then dropped three inches apart in the drills and the earth from both sides was drawn up firmly to them. Meanwhile seed from the same package had been sown in ten rows, each 10 feet long, immediately adjoining but at right angles to the transplanted rows. At the time of transplanting, the plants from seed were two inches high. Both lots received the same care and treatment throughout the season except for the less weeding required by the transplanted rows. The fifty feet of transplanted onions yielded two bushels and one peck of bulbs, while the 100 feet of onions from seed yielded only two bushels, a gain in favor of the former of over 100 per cent. The individual bulbs also showed a marked difference in size, the smallest of the transplanted bulbs being larger than the largest bulb from seed. Two of the largest of each kind were brought to the

Station by Mr. Beecher and photographed (Plate I, Fig. 2). These measured respectively 13 inches and 8.7 inches in circumference. Mr. Beecher further states that the transplanted bulbs matured from two to three weeks earlier than those from seed, and that there were much fewer scallions among the former than among the latter. These very large onions would seem to be rather too large for the ordinary onion trade, but, as noted by several growers, they could doubtless be brought to compare favorably in size and appearance with the imported Spanish onions which bring fancy prices.

SUMMARY.

The experiments above described show the following advantages of starting onion-seed in flats with heat, and transplanting the seedlings to the field.

1. This method insures a clean crop even upon smutty land.
2. Transplanted onions are less liable to the attacks of cut-worms than onions sown in the field.
3. The crop matures earlier by three or four weeks.
4. The crop is larger by an average of 50 per cent. or more with native varieties, and the average increase with large foreign varieties may exceed 100 per cent.
5. The individual bulbs are larger and mature more evenly.
6. The increase in the size and quality of the crop, the earlier ripening, and the lessened expense incident to the care of the plants after transplanting, offset in a measure the cost and labor of raising and transplanting the seedlings.
7. This method may be applied with certain profit wherever it has been the custom to grow onions from sets upon smutty land, or in small quantities for home use or small sales.
8. Several observers state that this method is applicable on a large commercial scale. Carefully estimated figures relative to the number of seedlings required per acre, the quantity and cost of sash for forcing-frames, the labor and time required for transplanting, the comparative cost of caring for the crop, and the comparative value of the yield, will be found in "The New Onion Culture," by T. Greiner, LaSalle, N. Y., 2d edition, revised, Jan., 1892; Bull. Ohio Agr. Exp. Station, 2d Series, Vol. III, No. 9; Bull. Tenn. Agr. Exp. Station, Vol. V, No. 4; and Bull. N. Dak. Agr. Exp. Station, No. 12.

A LEAF CURL OF PLUM.

By Wm. C. Sturgis.

On June 6th of the past summer I received from Mr. J. L. Raub, of New London, some leaves of a cultivated variety of Japan Plum which were evidently suffering from the attacks of a fungus related to that which causes the "leaf-curl" of peach. In this case the appearance was very peculiar. The fungus had attacked the terminal shoots and young leaves, causing them to become swollen and distorted. The young green shoots were in some cases swollen to three or four times their natural size, and transformed into a semi-hollow mass of spongy tissue, externally mealy in appearance, and white or pinkish in color. Sometimes the whole cluster of young leaves at the tip of a diseased shoot was involved, so that the individual leaves were hardly distinguishable; in other cases the stalks and bases only of the leaves were attacked and the narrow green leaf-blade presented the peculiar appearance of growing from the white spongy mass below. At this time the few fruits which had set were about a quarter of an inch long. The fruit itself, that is the ovary of the flower, was not invaded by the fungus to any extent; the structure was normal and the young stone could easily be seen when the fruit was cut open; it was certainly not, therefore, a case of "plum-pockets." The stems of the fruit were, however, diseased in almost every case; they were very much swollen, whitish and mealy in appearance, and bore at their extremities the dried petals and stamens together with the young fruit. Specimens of the diseased tips are figured in Pl. II. Investigation of Mr. Raub's orchard showed that fully 80 per cent. of the plum trees were suffering from the disease, almost every terminal shoot of the season's growth being affected. The perennial character of the disease was indicated by the fact that although when it appeared the previous season, the diseased leaves and twigs had been removed and burned as fast as they formed, this proceeding proved of no avail in checking the trouble, and it reappeared the following spring with such virulence that much more radical measures became necessary. Under the circumstances, the only course to be recommended consisted in removing and burning the infested twigs as far as practicable and in pruning severely in the early winter, cutting out and destroying most of the present season's growth. If this were followed by treatment of the trees in early spring with a strong solution of copper sulphate, and later with Bordeaux mixture, it seemed probable that the disease might be eradicated, and Mr. Raub was so advised.

The accurate determination of the fungus causing the trouble proved to be a matter of some difficulty. Several species of the genus to which this fungus belongs, are known to attack the leaves and young shoots of our wild and cultivated plums; these species are enumerated as follows by Atkinson:*

On *Prunus Americana*, Marsh. (Wild Red Plum) *Exoascus decipiens*, Atk.

On *Prunus nigra*, Ait. (Wild Red Plum) *Exoascus decipiens*, Atk.

On *Prunus angustifolia*, Marsh. (Chickasaw Plum) *Exoascus mirabilis*, Atk.

On *Prunus hortulana*, Bailey. (Wild Goose Plum) *Exoascus mirabilis*, Atk.

On *Prunus triflora*, Roxb. (Japan Plum) *Exoascus rhizipes*, Atk.

E. F. Smith† records the occurrence of a leaf-curl on cultivated varieties of *Prunus Chicasa* (*Prunus angustifolia*) in Maryland and Georgia, which Atkinson (l. c., p. 336) refers to *Exoascus mirabilis.* Finally, Crozier reports a plum leaf-curl "on a vigorous grower and light bearer known as Maquaketa," at Ames, Iowa. This fungus Atkinson again (l. c., p. 340) identifies with some doubt as *Exoascus mirabilis.* It will thus be seen that all the varieties of our cultivated plums of the *Americana*, *Chicasa*, and *hortulana* types, as well as the Japanese varieties, are subject to leaf-curl caused by one of three species of a fungus belonging to the genus *Exoascus.* Microscopic examination of the species in question leaves little room for doubt that it is identical with Atkinson's *Exoascus mirabilis.* This species would seem to be wide-spread, and very destructive in its effects. Atkinson reports it from Columbia, S. C., and Auburn, Ala., on the wild Chickasaw plum and its cultivated varieties; on the same host in Iowa; and on the cultivated varieties of the Wild Goose plum (*P. hortulana*) from four localities in Iowa. Smith and Atkinson record its occurrence in Maryland and Georgia. Galloway and

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* Cornell Univ. Ag. Exp. Station, Bull. 73, Sept., 1894.

† Journal of Mycology, Vol. VI., p. 108, 1891.

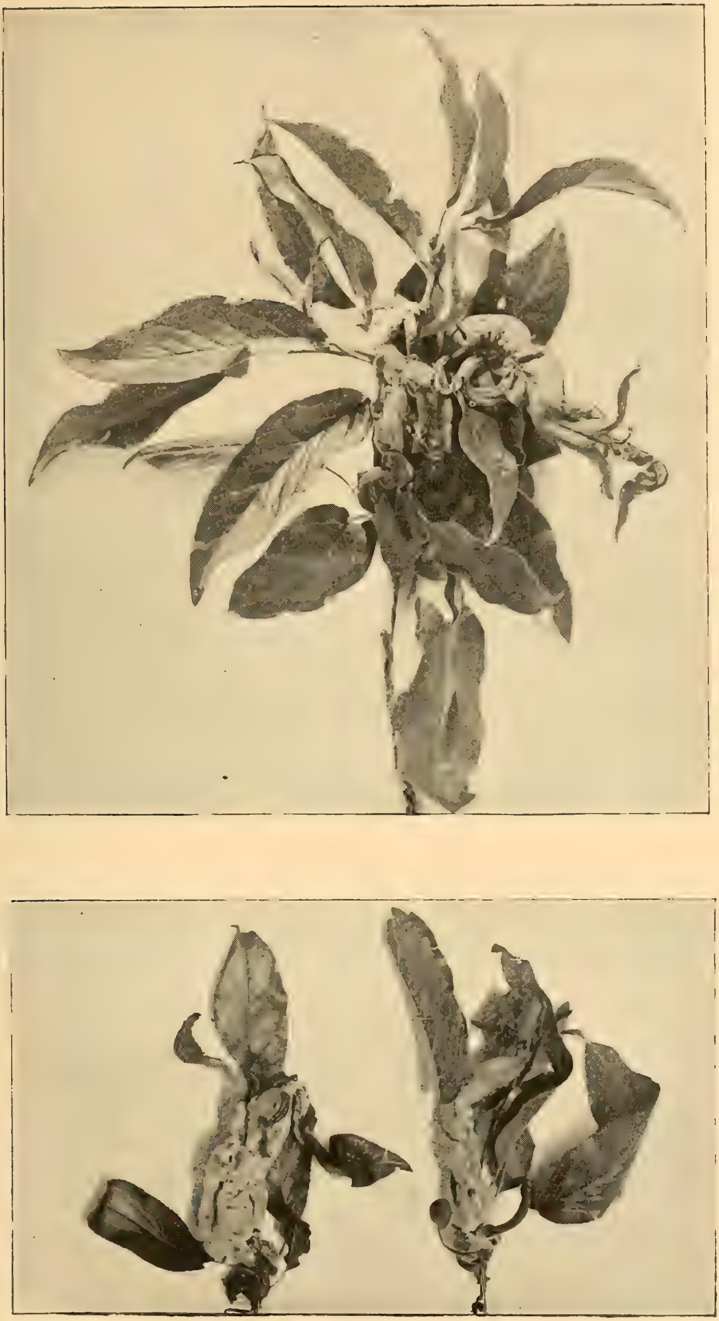

PLATE II. LEAF-CURL OF JAPAN PLUM.

Atkinson report it on the variety Maquaketa at Ames, Iowa, this variety, according to Atkinson, being "inadvertently referred to the Chickasaw plum." Finally, its occurrence in Connecticut marks an extreme easterly limit.

The serious injury which it causes has been already referred to, as well as the means which may be taken to eradicate it. It must be borne in mind that this fungus belongs to a genus in which the vegetative portion or *mycelium* lives from year to year within the tissues of the diseased shoots; the pruning-knife must therefore be depended upon to remove the existing trouble, and fungicides to prevent subsequent infection. One of the striking characteristics of the Japanese plums heretofore, has been their comparative freedom from the diseases to which our native varieties are subject. The appearance of so serious a trouble as this leaf-curl is therefore of great scientific and economic importance, and growers are warned to watch for the first appearance of the disease, and to take immediate action to prevent its spread.

MISCELLANEOUS NOTES ON VARIOUS FUNGUS DISEASES.

By Wm. C. Sturgis.

The Powdery Mildew of Grapes (*Uncinula spiralis, B. & C.*).—Early in August a package of grapes was received from Mr. A. B. Plant of Branford, who reported that a large percentage of his grapes had been ruined by a disease quite unfamiliar to him, but well illustrated by the specimens sent for examination. The appearance of the grapes was peculiar, and inasmuch as this particular effect of fungous attack is somewhat exceptional, a brief note on the subject may be of interest.

The surface of the grapes showed a somewhat blotchy appearance, and the skin was abnormally thick and leathery; the principal damage however, was due to a cracking of the berries lengthwise, in some cases so severe as to expose the seeds. Microscopic examination of the berries showed no trace of any fungus, but the peculiar thickening of the skin in places, led to the conclusion that the cracking was due primarily to an early attack on the part of the fungus mentioned above. The powdery mildew is much less common in Connecticut, and does less damage as a rule than the downy mildew [*Plas-*

mopara viticola (B. & C.)]. When the former does occur it is usually confined to the upper surface of the leaves, and seldom attacks the fruit. In this case however, the leaves were very slightly affected. The powdery mildew is superficial in its manner of growth, sending its vegetative and fruiting threads in the form of a white, frost-like covering over the surface of the host and drawing nourishment from the latter by means of small suckers which penetrate the tissue. If, as in this case, the grapes are attacked while very small, those portions of the surface upon which the fungus grows, cease enlarging because of the exhausting effect of the fungus; the tissues beneath, being uninjured, continue growing, and eventually the difference in increase between the internal portions and the external cells causes the skin to split open. As the grapes increase in size, the same conditions being operative, the crack becomes deeper, and the smaller the grapes when first attacked, the deeper will the crack eventually extend. Meanwhile spraying begun after the fungus has injured portions of the surface of the fruit beyond recovery, checks its further spread upon the fruit or to the leaves, rains wash off the now dead and loosely adhering fungus threads, the suckers dry up or are concealed in the tissues of the thickened skin, and no evidences of the attack remain except the cracks, which are deepened continually by the natural growth of the berry. Such seems to have been the cause of the trouble in the present instance. The remedy consists in early and thorough spraying, once just before the blossoms open, and again as soon as the blossoms have fallen.

A DISEASE OF MELONS (*Alternaria sp.*).—Late in August specimens of Musk-melon leaves were received at the Station from Mr. S. B. Wakeman of Saugatuck. The leaves were evidently diseased, and Mr. Wakeman wrote that the trouble was spreading very rapidly over his melon ground notwithstanding applications of Bordeaux mixture. A visit to Saugatuck confirmed Mr. Wakeman's report. Of three large fields of melons, one was completely ruined, and the other two showed abundant evidences of disease. The trouble seemed to start at the center of the hills and extend rapidly outwards. It was characterized by a wilting of the leaves, followed by the appearance of small yellowish spots and blotches; these increased rapidly in size, the surface of the diseased areas became marked with dark, concentric rings, the tissues became dry and brittle, and upon all the older spots there was a copious growth of black mould distinctly visible with a lens. Microscopic examination showed that the leaf-tissue in every diseased spot was traversed by delicate, colorless threads, which, coming to the surface either singly or in little erect tufts, gave rise to short chains of large, brown, club-shaped spores, provided with a long erect appendage, and serving to place the fungus in the genus *Alternaria.* No other fungus was found in connection with the trouble, and this, together with the fact that the *Alternaria* was found abundantly in every one of the diseased leaves examined, produced a strong impression that the disease was due to the fungus in question. There was no opportunity however, to prove this supposition by the inoculation of sound leaves with a pure culture of the *Alternaria.* When the field was first examined, late in August, the plants had received two applications of Bordeaux mixture, but it had not been applied very evenly. The only thing to be done under the circumstances was to recommend another immediate and thorough application of Bordeaux mixture, especially upon those portions of the vines at a distance from the centre, which as yet showed no symptoms of the disease. There was but little hope however, of saving the crop to any great extent, and as the result proved, the disease continued to spread even after thorough treatment of the vines with Bordeaux mixture.

There are a number of fungi which are known to affect the leaves of melons, but the one in question is probably identical with the species of *Alternaria* recently described by Smith and by Peglion as affecting melon-leaves in this country and in Italy. Whether in this case the fungus was a true parasite, or whether it merely followed an injury due to other causes, must remain an open question for the present.*

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*Since the above was written, pure cultures of this fungus have been obtained by inoculating sterilized tubes of prune-agar with spores from the diseased leaves. These cultures furnished spores which were used in the inoculation of leaves of growing melon and tomato plants. In the case of the melon the inoculation has been successful even upon normal, uninjured leaf-tissue, proving beyond question the connection between the fungus and the disease. With the tomato, the inoculation of leaf-tissues which were injured has resulted in a diseased condition identical with that seen in the melon, and at the present time similar results seem liable to follow from the inoculation of sound tissues. Should these experiments prove that the tomato as well as the melon is susceptible to this disease, some doubt may arise as to the propriety of the name which has been given to the fungus. In other words the fungus causing a diseased condition of melon-leaves may prove to be identical with a species previously described from some other plant. It is hoped that the series of cultures and inoculations now in progress at this Station may serve to settle this question.

THE LEAF-SPOT OF PLUMS (*Cylindrosporium Padi*, Karst.).—This fungus, which attacks both the plum and cherry, is not usually abundant in Connecticut, but this year there was at least one serious case. The trouble is manifested by the premature yellowing and falling of the leaves. The affected leaves are marked upon the upper surface with numerous small greenish or brownish spots with paler centres and sharply defined borders. Later the tissue of these diseased spots dies and separates from the surrounding tissue, leaving the leaf pierced with a number of roundish holes whence the name "*shot-hole fungus*," sometimes applied to the disease. The owner of the orchard in which the trouble appeared wrote under date of Aug. 17th, "Three-fourths of the leaves are off now or soon will be; the trees have not been sprayed. My trees at home, of the same variety, which have been sprayed twice, are the picture of health." Comment is unnecessary.

HOLLYHOCK RUST (*Puccinia Malvacearum*, Mont.).—This fungus is interesting as having sprung into notoriety within comparatively few years. It was first described from Chili, and spread thence to Europe, where it increased so rapidly that by the year 1875 it had become a well-known disease of great severity. It first appeared in this country in 1886, and has spread with remarkable rapidity, particularly in the Eastern States, so much so that it now ranks as a fairly common disease of hollyhocks, and it is by no means rare to find all the plants in a single locality completely ruined by it. Fortunately it is quite unmistakable and easily recognized. It is characterized by the appearance, on the lower surface of the leaves, of small warts about twice the size of a pin-head; these are at first yellow, but soon change to a purplish-gray or brown color. On breaking open one of these little warts, the interior is found to be composed entirely of a dark brown dust—the two-celled spores of the fungus. The fungus appears to pass the winter in the remains of old hollyhock plants, or upon the first-year leaves, whence it spreads in the spring to the new growth, appearing visibly upon the leaves and stems in June. In severe cases the leaves are so permeated by the fungus that they wither and fall early, and the flowers fail to mature.

The "rusts" are all extremely difficult to combat with fungicides. Their appearance upon the surface only after a long period spent within the tissues of the host, protects them from injury until most of the damage has been done; while their large, thick-walled spores seem to be peculiarly resistant to the effects of fungicides. The most practical method of preventing the spread of the disease would seem to be the destruction by fire of all refuse of infested plants, and the avoidance of land upon which rusted hollyhocks have previously grown. Picking off and burning the leaves as fast as the disease appears upon them would doubtless assist in checking its spread ; and in England a wash consisting of two tablespoonfulls *of a saturated solution* of permanganate of potash, added to one quart of water, and applied with a sponge, has proved efficacious in checking the disease.

NOTES ON INJURIES DUE TO PHYSIOLOGICAL CAUSES.

By Wm. C. Sturgis.

Winter Killing of Peach Trees.

A peculiar and rather obscure trouble manifested itself last spring in a number of peach orchards throughout the State, and specimens were sent to the Station for examination. In every case the symptoms were as follows : With the opening of the season the trees were apparently thrifty, and produced leaves and blossoms normally. About the middle of May evidences of a diseased condition suddenly appeared. One portion of an otherwise thrifty tree seemed on the point of dying; upon cutting through the bark, the wood appeared blackened and dead, or in less severe cases showed brownish streaks, especially in the delicate tissue just beneath the bark. The leaves upon these affected portions ceased growing and became stunted and wilted, while a red discoloration appeared in spots upon the leaves, especially at the tips. No external cause of the trouble could be found; borers were in no case present, nor could any parasitic fungus be traced in or upon the affected portions. No serious frost had occurred since the trees began their growth. Eventually the trees which seemed to be but slightly affected recovered ; while others in which the injury was more severe, suffered a gradual loss of vitality, and finally died. I was for some time at a loss to determine the cause of the injury, but conversation with a number of experienced growers led to the conclusion that it was due to severe and sudden changes of temperature during the winter. It will be remembered that the winter of '94–'95 was characterized by two or three short periods of extremely cold weather accompanied by high winds, preceded and followed by longer periods of mild weather. It seems highly probable that these sudden changes of temperature affected unfavorably a few trees here or there which were constitutionally weak, and whose thin bark caused the delicate underlying tissues to be peculiarly susceptible to such changes. Under such circumstances the tissues which remained uninjured might perform their functions for a time, and enable the tree to leaf out, while in some cases the trees might be injured past recovery. There seems to be no practical method of guarding against injury of this kind, and the conditions which induce it are probably too exceptional to warrant serious apprehension.

FROST INJURY TO PEARS.

A peculiar injury to pears was very prevalent during the spring of 1895 in many sections of the State. It appeared very early upon the fruit, when the latter was from one-half to three-quarters of an inch long, as a russet band or blotch upon the surface. Generally this russet appearance was limited to the calyx end of the fruit; occasionally it partly or entirely encircled the fruit midway between the stem and the calyx. The same appearance was seen rarely upon apples. The opening of the season was characterized by one or two sharp frosts after fruit had set, and it was natural to regard the late frosts and the injury as cause and effect. This view is substantiated by Mr. G. Harold Powell of Cornell University, who says*: "This belt is due to an injury to the epidermis of the fruit in its young stage, and is caused by the freezing of dew collected on these spaces. The fruit at this time is upright, and the place where the dew collects is probably determined by the formation and position of the fruit." The russet appearance is a result of the natural process by which plants commonly repair their surface injuries, viz., the development of cork. The portions of the epidermis thus injured and healed, cease expanding, and as the remainder of the fruit continues its growth, the uninjured epidermal cells immediately adjoining the injured portion become gradually ruptured, and in their turn give rise to a growth of cork, so that the russet area increases in extent with the growth of the fruit.

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* Garden and Forest, Vol. VIII., p. 417, Oct. 16th, 1895.

NOTES ON INJURIOUS INSECTS.

By Wm. C. Sturgis.

The Wheat Midge (*Cecidomyia Tritici.*).—A number of heads of rye were received early in June from Coventry which were undoubtedly suffering from the depredations of this insect. The heads were partially eaten out, the lower kernels being entirely destroyed, leaving only the chaff. Our correspondent stated that at the time of writing, June 5th, the trouble was spreading rapidly. The injury is caused by the grubs or maggots of a small insect nearly related to the "Hessian Fly" (*Cecidomyia destructor*). The eggs are deposited among the chaff of the heads of a variety of grains, and the small grubs, which soon hatch out, eat into and destroy the maturing kernels. The only remedies which have been recommended for this pest consist in gathering and burning the infested heads; deep plowing of infested fields, whereby many of the insects are killed; planting a small quantity of grain very early, in order that after it has become infested by the midge it may be ploughed under or destroyed before the land is sown for the final crop; and planting varieties which mature early, such varieties being less liable to attack than those ripening later.

The Bark-beetle (*Scolytus rugulosus*, Ratz.).—This insect, to which attention was called in our Report for 1894, seems to be increasing in the peach orchards of the State, and bids fair to become a serious pest. Specimens of the bark and wood of peach trees received in May from the eastern part of the State were completely riddled with the small "shot-hole" punctures of the insect, each puncture exuding a drop of gum. The only remedy which can be suggested is of a purely preventive nature, and consists in applying to trees liable to attack, a lime-wash to which a small quantity of Paris green has been added. In case a tree is very badly infested with this borer, it had better be destroyed at once; trees only slightly attacked have been known to recover.

SCALE-INSECTS.*

THE SAN JOSÉ SCALE (*Aspidiotus perniciosus*, Comst.).—This pest was found last summer for the first time in Connecticut, infesting an orchard of peach, plum, and apple trees, in the vicinity of New London. The discovery was deemed of sufficient importance to be made the subject of a bulletin (Bull. 121, July 1895, republished in this Report, p. 194), which was distributed widely, and the reader is referred to that publication for detailed information regarding the occurrence, characteristics, and life-history of the insect, and the methods which have elsewhere proved successful in eradicating it. Since the publication of our Bulletin 121, information has been received of the appearance of the scale in other orchards near New London, and specimens have also been received from Hartford. There can be little doubt that the scale was introduced into Connecticut upon stock purchased from a New Jersey nursery prior to 1894, at which time the proprietors of the nursery discovered that their stock was infested, and by prompt and energetic measures succeeded in stamping out the trouble. Meanwhile however, between the years 1890 and 1894, during which time the infested stock had escaped notice, the firm had supplied no less than ninety-two individuals in this State with young fruit-trees. It seemed probable, therefore, that the San José Scale might be much more widely distributed in Connecticut than the information at hand would lead one to suppose.

Great credit is due to the New Jersey firm of nurserymen for the prompt and thorough manner in which they met and overcame the trouble in their own nurseries, as soon as the matter was called to their attention; and also for their courtesy in responding to our request for a list of the fruit-growers in Connecticut whom they had supplied with stock between the years 1890 and 1895. A circular letter was recently sent to each person on this list requesting him to examine such stock as he had purchased in New Jersey between the years above mentioned, and to report to us whether or not the San José scale was to be found upon it. A postal card was enclosed with each circular, together with a copy of our Bulletin 121. The replies thus far received show cause for some apprehension; the only locality where a serious outbreak is definitely known to have occurred is in the neighborhood of New London, and there vigorous treatment of the infected trees is proving effectual. In Hartford the scale was found upon one pear tree purchased in New Jersey, but it had not spread to other trees, and the infested tree was, upon our recommendation, destroyed. The latest information received is from the neighborhood of Bridgeport, where, judging from samples lately received, the scale is present in numbers sufficient to cause very great damage to apple, pear, and peach stock. The owner of the trees in question has expressed his determination either to destroy the infested trees or to rid them of the pest by treatment with whale-oil soap.

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* For the identification of most of the species herein noted I am indebted to the kindness of Profs. Comstock and Slingerland of Cornell University.

SCALE ON TULIP-TREES (*Lecanium Tiliæ*, Fitch). — Specimens of this large, convex, brown scale were received in August from Hartford, where they were reported as covering the bark of tulip-trees (*Liriodendron tulipifera*), and injuring the trees to a very serious extent. It has also occurred upon tulip-trees in New Haven. According to Prof. Slingerland this insect is identical with that described by Prof. Cook* as *Lecanium tulipiferæ.* The owner of the infested trees was advised to scrape off as many of the scales as could be conveniently reached, to apply strong kerosene emulsion in the late autumn as recommended for the San José scale in our Bull. 121, and to follow this up with an application of a weaker form of the emulsion as soon as the young insects were seen to be emerging from beneath the scales, which would probably take place during the following June. We have yet to hear the result of this treatment, but there is every reason to suppose that it will prove satisfactory.

SCALE ON OAK (*Asterodiaspis quercicola*, Bouché).†—Specimens of this insect were received early last March from the proprietors of the Elm City Nursery of New Haven; they occurred in large numbers on the limbs and terminal twigs of the British or Black Oak, *Quercus Robur*, and were undoubtedly the cause of considerable injury. The insect however, is not a common one, and its appearance in numbers sufficient to cause serious apprehension is hardly to be expected.

The scales received early in March covered living eggs, which, in the warmth of the laboratory hatched out during the last week in April, probably at least two weeks earlier than they would have hatched in the open air. Two or three applications of kerosene emulsion or whale-oil soap, beginning about the middle or latter part of May, would doubtless be an effective remedy. In very severe cases a treatment with strong kerosene emulsion in winter, or as soon as the trees become thoroughly dormant, might be advisable. This treatment is recommended only for nursery stock; if large trees are infested they had better be destroyed.

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* Canadian Entomologist, Vol. X, p. 192.

† U. S. Dept. of Agric., Report for 1880, p. 330.

Scale on Honeysuckle (*Lecanium sp.*).—Our cultivated shrubs are not as a rule subject to injury from scale insects; it is therefore of interest to note the occurrence of a species of *Lecanium* on a shrubby honeysuckle, probably one of the Japanese species of the genus *Diervilla*, commonly cultivated under the name *Weigela.* Specimens of this shrub were received from Waterbury in June, but they were too scanty to allow of accurate determination. The scales were numerous upon all of the twigs received, and are evidently capable of doing serious injury to this most useful and showy shrub. In this case again, applications in early summer of kerosene emulsion or whale-oil soap are to be recommended.

THE SAN JOSÉ SCALE.*

By Wm. C. Sturgis and W. E. Britton.

Occurrence in Connecticut.—The appearance of the San José scale (*Aspidiotus perniciosus*) is an event of very great importance to all our fruit growers.

During a visit to the orchard of Mr. Joseph L. Raub of New London, on June 12th, we were struck by the appearance of certain young peach trees which were then apparently dead, though earlier in the season they had put out a few leaves near the tips, and last year had been exceptionally vigorous. Close inspection showed that in every case the trunk and larger limbs were fairly incrusted with a grayish coating composed of vast numbers of scale insects. These so resembled the published drawings of the

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* This paper, first printed in Bulletin 121 of this Station, is here reproduced in slightly amended form. See also "Notes on Injurious Insects," page 192.

San José scale, Fig. 1, page 196, that they were suspected to be that pest. Specimens were at once submitted to the experienced entomologists, Messrs. L. O. Howard of the U. S. Department of Agriculture and M. V. Slingerland of Cornell University, who kindly examined them and confirmed our conclusion. The specimens secured on June 12th were small and undeveloped, having apparently died while still in the hibernating condition. On June 20th, careful notes were taken of the condition and surroundings of the orchard, which occupies an isolated position on the outskirts of the city, with no other orchard in its vicinity, and which contains a variety of fruit trees from one to four years of age. It was evident that the scale had not come from the neighborhood, but it was still more evident that the orchard in its present condition might be a fertile source of infection, for living scales were found upon fully one-half of the trees. All the trees came originally from a firm in New Jersey, and were set out in or since 1891. The plantings of 1891 and 1892 were very badly affected, many of the trees being completely dead and covered with the scale, others being killed to the ground but sending up new shoots from the roots. Living scales were found principally upon the trees set out in 1893, but the insect had not yet completely infested these trees, which remained comparatively vigorous. The trees set out in 1894 were practically free from scale. From these facts it is evident that the insect was introduced upon the stock of 1891 and 1892 and had developed until the trees died; and that the stock of 1893, while originally infested equally with the previous plantings, had remained sufficiently vigorous to show but little evidence of the attack. Doubtless, however, these trees offered suitable conditions for the breeding of the pest and its spread to the still unaffected trees of the planting of 1894. The freedom from scale of the latter was undoubtedly due to the energetic and successful measures adopted in 1894 by the New Jersey firm to eradicate the scale from their nurseries by the destruction of all infested trees, and the fumigation of all suspected stock before placing it upon the market.

Since our first visit, Mr. Raub has undertaken to destroy the trees in his orchard which are most seriously infested, and to apply to the others a strong solution of whale-oil soap. This will undoubtedly check the spread of the scale until next winter, when more drastic remedies can be applied to the dormant trees.

General appearance of the Scale.—When the scales occur singly they are not easy to detect with the naked eye; but when, as is usually the case, they occur in groups, they are easily seen as a grayish and roughened or pimply coating upon the bark, as shown in Fig. 1. This coating, when scraped off with the thumb-nail or with the blade of a knife, appears mingled with a yellowish liquid if the insects composing it are alive. In severe cases the bark is completely covered with this scaly coating, and upon removing the bark the delicate tissues beneath are seen to present a pinkish or purplish color. When a tree is but slightly affected, the scales are usually found singly or in small groups upon the twigs, often at the base of the leaves. When the scales occur upon the fruit, it is usually in the form of scattered individuals closely attached to the surface, each one being surrounded with a purplish ring, Fig. 2. The separate scales measure, when fully grown, about one-eighth of an inch in diameter, are almost circular, slightly convex with a minute blackish projection in the center, and are of a dirty brown or gray color. The scale may be easily lifted upon the point of a pen-knife, and the insect beneath it, if alive, is seen as a small bit of yellowish jelly. This scale differs in appearance from other scales commonly found upon fruit trees; it is rounder than the "oyster-shell bark louse," and is smaller and darker in

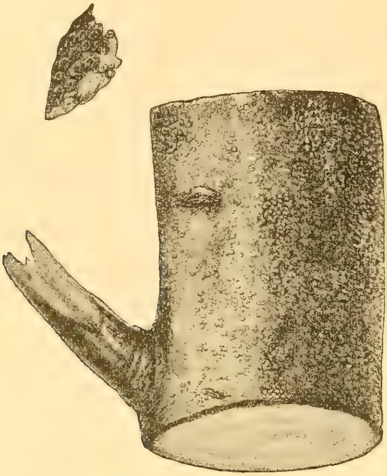

FIG. 1.—San José Scale: Apple Branch, with scales—natural size.—(From *Insect Life.*)

color than the "scurfy bark louse." In fact it is the only scale among those commonly found on fruit trees in Connecticut, which is distinctly circular in outline.

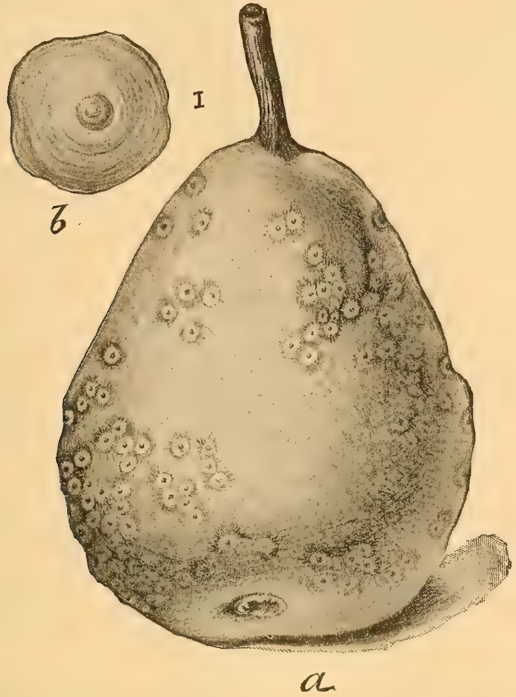

FIG. 2.—San José Scale: *a*, Pear, moderately infested—natural size: *b*, female scale—enlarged.—(From *Insect Life.*)

Effect of the scale on the trees.—The pernicious effects of the San José scale are in a great measure due to its inconspicuous character, and to the fact that its effect upon the vitality of the tree is not at once apparent. During the first season of its attack, the tree may be apparently healthy, with full leafage and abundant fruit. As the scale spreads, however, the effect becomes more plainly visible, though it is such as might readily be attributed to the attacks of borers or to drought. Only the most careful observation will discover the true cause of disturbance. Generally by the second or third season only does the scale become so abundant as to be conspicuous, and by that time the whole tree is infested with the grayish coating of scales; in its weakened condition it succumbs easily to an exceptionally severe winter, and though it may put forth leaves, they shortly wither, and before the cause of the trouble is actually known, the tree is practically dead. If taken in time, however, it is not difficult to check its ravages, and we would therefore urge all fruit-growers to inspect their trees with care, and to send us specimens of any insect found bearing resemblance to this scale.

Plants subject to the attacks of the scale.—The San José scale has been thus far found in Connecticut upon the Peach, Apple, Pear, Plum and Currant, but information from other States shows that it may attack most of our large and small fruits, and the rose, hawthorn, elm, basswood, alder, sumach, English walnut and various evergreens.

Origin and spread.—This insect was formerly supposed to have been introduced into California from Chili, in the year 1870, but later information obtained by Mr. L. O. Howard, Chief of the Division of Entomology, U. S. Department of Agriculture, seems to show that our Pacific coast was probably its original home, whence it spread to Chili and other countries.

It was first noticed by fruit shippers near San José, Santa Clara County, California. No exterminative measures were at once taken and a few years later the Pacific slope was largely infested.

Prof. J. H. Comstock first described it in the report of the U. S. Department of Agriculture for 1880. He found it doing much damage in California and regarded it as the most destructive scale insect known.

The Atlantic States, however, were supposed to be uninfested until the summer of 1893, when it appeared upon orchard trees in Charlottesville, Va. The attention of Dr. C. V. Riley, then U. S. Entomologist, was called to the fact of its presence, and measures for its suppression were immediately employed.

It was soon discovered that this was not the only center of infection, but that the scale existed at De Funiak Spring, Florida; Bartle, Indiana; Neavitt and Chestertown, Maryland; Lewisburg and Atglen, Pennsylvania, and in several localities in New York and New Jersey. It has recently been found in Delaware and on Long Island.

The introduction of the San José scale into the Eastern States has been traced to the importation of Japanese plum trees into New Jersey from California.

Like other scale insects, the San José scale can spread only a short distance each year, unless its distribution is aided by the agency of wind, water, or animals.

Probably its distribution in this country has been largely effected through shipments of fruit and nursery stock; but the insect has been found upon other insects, and these, especially the flying ones, have doubtless assisted in its dissemination.

Life History.—This insect is viviparous; i. e., brings forth living young, Fig. 3.

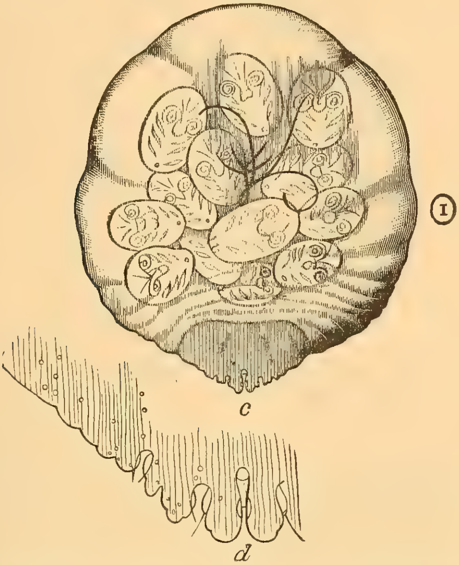

FIG. 3.—San José Scale insect: *c*, adult female containing young—greatly enlarged: *d*, anal fringe of same—still more enlarged.—(From *Insect Life.*)

In California three annual broods appear, but for our climate the number of yearly broods has not been definitely determined.

The San José scale survives the winter either in the egg or in a half grown state. It becomes fully developed and reproduces about the last of May or first of June, and successive broods appear until winter begins.

The newly born or hatched individuals, Fig. 4, unlike their female parent, have no scaly covering but crawl about like ordinary plant lice. They are very small at first. The period of activity lasts but a day or two, sometimes only a few hours, when the young insects settle upon the bark and become fixed.

The scaly covering then begins to form. The insect soon molts and the cast-off skin uniting with a waxy secretion forms the visible external scale.

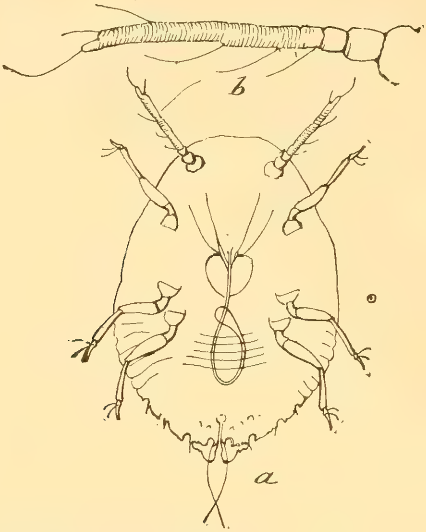

FIG. 4.—San José Scale insect: *a*, young larva—greatly enlarged: *b*, antenna of same—still more enlarged.—(From *Insect Life.*)

The female insect cannot change her place after the scaly covering begins to form, but the male is able to emerge from his cover, and being winged can travel short distances, Fig. 5.

Remedies.—As soon as the scale is discovered, and before any wash or other treatment is applied, the trees should be cut back as severely as seems advisable, and all the cuttings burned, as, in the case of newly infected stock, most of the scales occur on the terminal shoots.

Gas Treatment.—This requires an oiled canvas or some other gas-tight tent in which the tree is enveloped. Hydrocyanic acid gas is then generated by pouring, say three fluid ounces of water into an earthen-ware vessel, adding one fluid ounce of commercial sulphuric acid (oil of vitriol), and lastly one ounce (by weight) of fused potassium cyanide, these materials making enough gas to fill a space of one hundred and fifty cubic feet.

If this treatment is employed, the greatest caution must be taken not to breathe the gas, for hydrocyanic (or prussic) acid is a most dangerous poison.

According to Lintner (Bull. N. Y. State Mus., Vol. 3, No. 13, p. 302) Mr. Howard lately reports the gas treatment as not wholly efficacious in Virginia, possibly owing to the more complete dormancy of the insects in the East than in California, where it was first successfully employed.

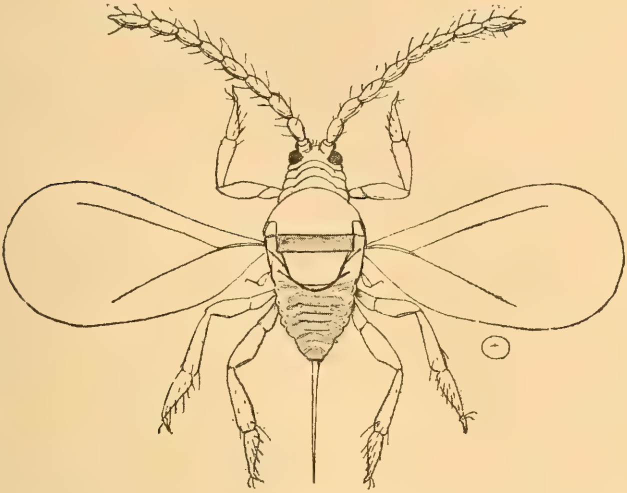

FIG. 5.—San José Scale insect: male adult—greatly enlarged.—(From *Insect Life.*)

Summer Treatment.—Either weak rosin wash or dilute kerosene emulsion is advised for keeping the scale in check during the Summer. Neither will do more than this, since the young hatch out at intervals throughout the Summer, and this treatment will not kill the mature scales.

The following formulas are recommended :—

WEAK ROSIN WASH.

Rosin	20 pounds
Caustic soda	5 pounds
Fish-oil	2½ pints
Water to make	100 gallons

Pulverize the rosin and soda, add the oil, and place the mixture in a large kettle with water sufficient to cover it. Boil for one or two hours with occasional additions of water, until the compound will mix perfectly with water instead of breaking up into yellowish flakes. Dilute for use to 100 gallons.

STANDARD KEROSENE EMULSION.

Kerosene	2 gallons
Common soap or whale-oil soap	½ pound
Water	1 gallon

Heat the solution of soap and add it boiling hot to the kerosene; churn the mixture by means of a force pump and spray nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens upon cooling, and should adhere without oiliness to the surface of glass. If the water is hard, add a little lye or soda, enough to make it feel very slightly slippery. For use, dilute with nine times its bulk of cold water.

Either of these washes should be applied at least three times during the Summer. As has been said, these washes will do no more than prevent the serious increase of the insects during the Summer. For thoroughly effective treatment we must rely upon strong washes applied in the Winter, when the trees are not liable to injury.

Winter Treatment.—The following applications are recommended for Winter use:

Whale-Oil Soap.—Two pounds of the soap are dissolved in one gallon of water and this solution is applied thoroughly, as a spray, or by means of a brush. Mr. Howard records this solution as "fatal to all the scales on the trees sprayed with it."

Strong Rosin Wash.—A rosin wash, made as given on page 201, but diluted to only 16 gallons, is recorded by Mr. Howard as "fatal to all the scales on the trees sprayed with it."

Potash Wash.—Dr. Smith recommends, as a result of his experiences in New Jersey, a wash consisting of a saturated solution of crude or commercial potash, i. e., potash in a quantity of water just sufficient to dissolve it. This is applied with a cloth or a brush, or as a spray. The potash serves to corrode and loosen the scales, killing many of the insects beneath them; and a spray of kerosene emulsion a month later completes the work of destruction.

On the whole, the Winter treatment with whale-oil soap, or strong rosin wash, seems to leave nothing to be desired, while in order to keep the insect in check during the Summer, or until this treatment can be safely applied, either of the two Summer washes described above will prove valuable.

Winter Treatment should be applied soon after the leaves fall, as the scales are thought to be more susceptible at that time than later in the winter.

Summer Treatment should be applied at least three times at intervals during the summer. Frequent rains necessitate repeated applications.

FURTHER NOTES ON INJURIOUS INSECTS,

By W. E. Britton.

THE PLANT-HOUSE ALEYRODES.

(*Aleyrodes vaporariorum?* Westwood.)

Order, Hemiptera: Family, Aleyrodidæ.

For several months tomato plants in the forcing house have been infested with these small, scale-like insects. The larvæ are found upon the under surface of the lower leaves of the plants, appearing as small white specks. The adults, which much resemble tiny white moths, may be seen flying about.

The genus *Aleyrodes* has not been studied thoroughly in this country, and only a few of our species have been described. One species infesting the orange tree was figured and described by Riley and Howard, in Insect Life, vol. v, p. 219, having been named *A. citri*, previously, by Mr. Ashmead.

In the Report of the Kentucky Agricultural Experiment Station for 1890, p. 37, Prof. H. Garman records a species of *Aleyrodes* which occurs upon the strawberry in Kentucky. This insect answers very closely the description of *A. vaporariorum*, of Westwood.* It has been observed upon the leaves of *Abutilon avicennæ.*

Specimens from our forcing house were submitted to Prof. Garman, who reports that it is the same species which he found upon strawberry plants. I have also noticed this insect upon lettuce, cucumbers, *Ageratum Mexicanum*, *Maurandya Barclayana* and a species of *Abutilon.*

Prof. L. H. Bailey refers to this insect in N. Y. Cornell Station Bull. 28, p. 58, as being a pest of the tomato house. Dr. A. S. Packard mentions *A. vaporarium*† in his Guide to the Study of Insects, 9th ed., pp. 526 and 712, as occurring upon both strawberry and tomato plants.

The larvæ are covered along the edges and upon the dorsal surface with bristles, which can be seen with the naked eye. Many cast pupa skins are found fastened to the tomato leaves. The pupa skin cracks open along the back and allows the adult to escape. These pupa skins occur most abundantly on the older and lower leaves of the plant, while the young larvæ may be found adhering closely to the younger and more tender leaves. (See plate III.)

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* Gardener's Chronicle, 1856, p. 852. † *A. vaporariorum* was probably intended.

Flitting about the tops of the plants are the small, white, moth-like adults which are mating and depositing eggs. The egg is oval, slightly conical, with the large end attached to the leaf. Two females were observed depositing eggs upon lettuce. The beak was inserted in the tissues of the leaf and an egg deposited. The female then turned, using her proboscis as a pivot, and continued to deposit eggs in a circle of about 1 m. diameter. In one instance this circle contained six, and in the other nine eggs. These eggs hatched in eleven days.

Eggs are not always deposited in circles: I have frequently found them single. When first deposited, the eggs have nearly the color of a lettuce leaf, but shortly become dark and brown.

In the adult stage both sexes have four wings, each with a single median vein. The color of the body is yellow, that of the wings, white. Antennæ are six-jointed.

Plate III shows the insect in the egg, larval and adult stages, from original drawings.

Tobacco fumes kill the adults, and in the greenhouse probably are the most satisfactory treatment. On plants out of doors, which cannot be fumigated easily, the insect may be held in check by frequent applications of whale-oil soap (1 lb. soap to 5 gallons water). Kerosene emulsion, which has proved most efficient against *A. citri,** would doubtless destroy *A. vaporariorum* as well.

A LEAF MINER OF THE CAULIFLOWER.

(*Drosophila flaveola*, Meigen.)

Order Diptera; Family, Muscidæ.

A leaf miner was observed, in June, upon the cauliflower. A dozen plants growing in the shade were seriously injured; all the larger leaves were tunnelled and soon dropped off. Some of the plants finally died. Leaves were gathered and adult insects were reared from the mines.

Specimens were sent to Mr. D. W. Coquillett, who identified the insect as *D. flaveola*, the larvæ of which are found in the leaves of radish and turnip. Mr. Coquillett has given a brief account of this leaf miner in Insect Life, vol. vii, p. 381.

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* Insect Life, vol. v, p. 224.

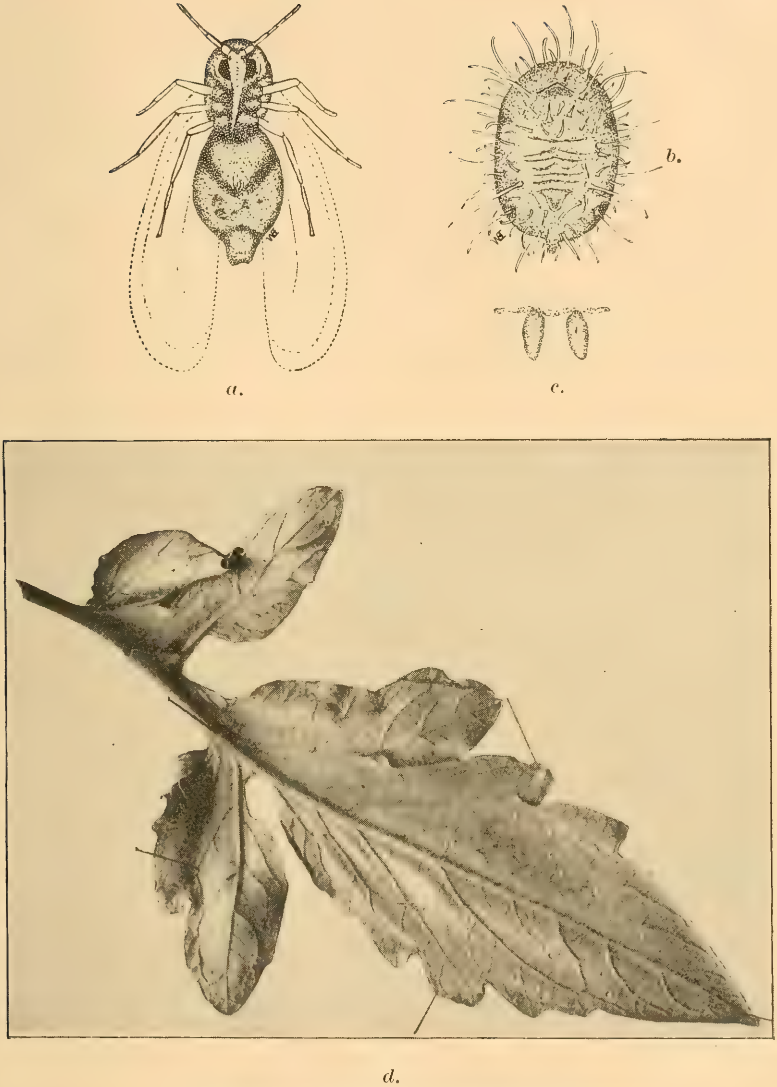

PLATE III. ALEYRODES VAPORARIORUM.

a. Adult magnified 51 diameters. *b.* Full grown larva. *c.* Eggs. Larva and eggs magnified 34 diameters, (original). *d.* Tomato leaf showing larvæ, (from photograph).

The adult is a two-winged fly, which deposits eggs in the tissues of the leaf. No experiments have as yet been made relative to a treatment for this leaf miner, but it is always wise to destroy all infested leaves. Mr. Coquillett writes me that so far as he is aware, this insect has not previously been reported as attacking the cauliflower.

CABBAGE PLUSIA ON TOMATOES IN THE GREENHOUSE.

(*Plusia brassicæ*, Riley.)

Order, Lepidoptera; Family, Noctuidæ.

On the morning of October 16th, green caterpillars were noticed in the forcing-house devouring the foliage of tomato plants, which were then about two feet in height. Fourteen of these caterpillars were found that day. Search was kept up for some time, but none were discovered after October 23d, twenty-five in all having been taken in the tomato-house during one week.

The larvæ were placed in a glass jar and fed with tomato-leaves, which they consumed voraciously. They were nearly all about full-grown and shortly began to pupate—one, in fact, changed on October 17th, the next day after imprisonment. They did not remain long in the pupal state. The warm air of the laboratory was favorable to development, and probably hastened the appearance of the adults, which came forth on October 31st and November 1st.

The insect proved to be the "Cabbage Plusia," the larvæ of which are quite common upon cabbages in the Southern, Central, and Middle-Atlantic States. Sometimes, in the absence of the cabbage, this insect attacks other vegetables, including celery, cauliflower, turnip, lettuce, dandelion and tomato.

The full grown larva is from 25 to 33 mm. (1 to $1\frac{3}{8}$ inches) in length, and 4 mm. in thickness at the thickest part, which occurs at the eighth segment. The color, above, is light green, indistinctly striped with white. The under surface is of a brighter green. There are two pairs of abdominal pro-legs. Though *Plusia* is a genus of *Noctuidæ,* the larvæ "loop" in traveling, much like Geometer larvæ; this is said to be due to the absence of front pro-legs. The full grown larva spins a white silken cocoon, usually on the under surface of the leaf, and becomes a brownish pupa. In about two weeks the adult emerges. The adult is a dark gray moth, each front wing having a silvery U-shaped spot near the middle.

Very likely the larvæ were feeding upon cabbages that grew in the garden near the forcing-house. They probably sought shelter from the cold, found their way indoors, where they at once began feeding, and where, if they had been allowed to remain, for a few hours even, they would have seriously injured several tomato plants by consuming the leaves.

THE RASPBERRY ROOT GALL-FLY.

(*Rhodites radicum*, Sacken.)

Order, Hymenoptera: Family, Cynipidæ.

The latter part of August, raspberry roots were received from Mr. C. C. Jones of Marlborough, Hartford County, Conn., which were covered with galls. Mr. Jones wrote: "I set some raspberry plants a year ago last spring and they are all dying. I send you a sample as they appear at the present time, and you will notice that there are worms at the roots. I set out some this spring and they are going the same way."

The injury is probably caused by the Raspberry Root Gall-Fly, which in its larval state produces rounded, warty galls, sometimes two inches in diameter, upon the roots of the raspberry, blackberry and rose. See plate IV.

These galls contain numerous cavities with a pithy substance intervening. Larvæ were found in these cavities. Plants attacked soon appear sickly and finally die.

There seems to be no remedy for the injury caused by this insect except to destroy the galls, and if plants are very badly infested they should be carefully dug up and burned.

The adult of this insect is a small four-winged fly about one-seventh of an inch in length. The head, thorax and abdomen are usually black, sometimes brown, with silky luster, and the feet are dark red.

According to Webster* these galls were first described by Harris† as being made by *Cynips semipicea*, Harr., but Sacken states that *C. semipicea* is not the cause of the gall and is probably a parasite of *R. radicum*.

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* Ohio Exp. Station Bull. 45, p. 156.

† Insects Injurious to Vegetation, p. 549.

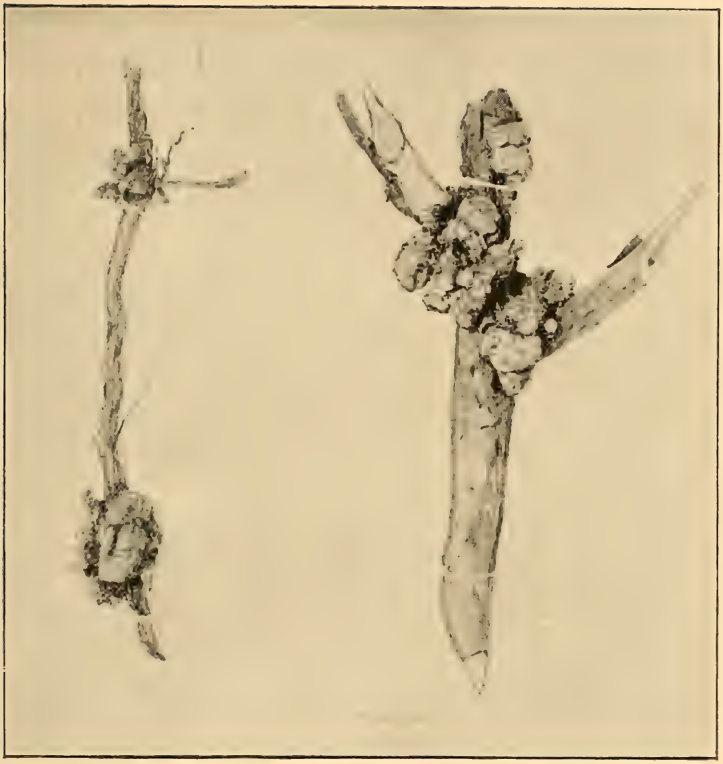

PLATE IV. RASPBERRY ROOT-GALLS.

THE CABBAGE ROOT MAGGOT.

(*Phorbia brassicæ*, Bouché.)

Order, Diptera: Family, Muscidæ.

The cabbage root maggot was reported as being injurious to cabbages in the town of Orange, Conn., during the latter part of May, 1895. The writer visited the fields of Mr. J. J. Merwin on May 25th and found fully two-thirds of the plants upon three acres of ground infested, while a large number of plants were seriously injured and a few had been killed. Other fields in the vicinity were also infested.

An application of lime and liquid manure (5 pecks of fresh lime slacked in 100 gallons of liquid manure) was advised for a part of the plants, in hope that the lime might kill the maggots, while the manure would stimulate the plants to outgrow the injury.

The owner began this treatment, but soon discontinued it, thinking the cost more than his plants were worth.

A "McGowen Injector"* was then procured and carbon bisulphide applied to 106 plants on June 4th. At this time the injury had gone so far that little or no benefit to the present crop could be derived from this treatment, which might, however, somewhat lessen the next year's brood of maggots.

Mr. Merwin finally lost about two-thirds of the plants on one field and one-third of those on another. On a third field, however, the cabbages suffered little, except that they did not head as early as where unattacked.

Mr. Merwin reports that he was unable to detect any difference between plants that were treated and those untreated, but thinks that the treatment would have proved beneficial had the applications been made earlier in the season when the larvæ first appeared.

An excellent account of this insect is given in the Cornell Station Bulletin 78, already referred to.

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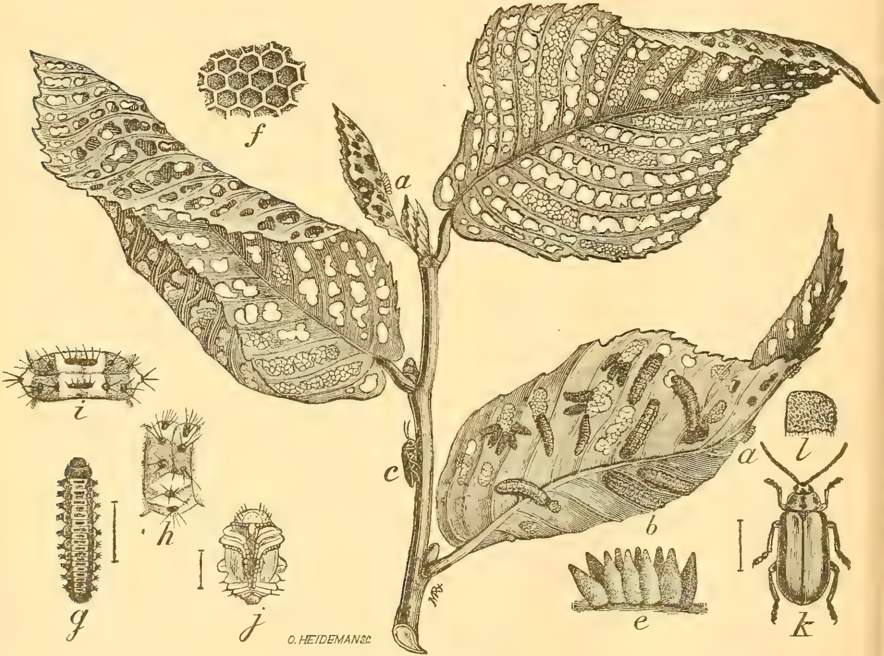
* Figured and described by M. V. Slingerland in N. Y. Cornell Station Bulletin 78, p. 533.

THE ELM LEAF-BEETLE (*Galeruca xanthomelæna*).*

Numerous inquiries have reached us lately regarding this insect, which is proving destructive to elm trees in many parts of the State. The beetle (see *c*, *k*, in the accompanying cut) deposits its eggs, *a*, *e*, in small clusters on the lower side of the young leaves early in June, the larvæ hatch out in about a week and at once begin feeding upon the leaves. These larvæ, *b*, *g*, are small worms about five-eighths of an inch long, marked on each side with a broad blackish stripe. They are soft, moist, and some-



Elm Leaf-Beetle.—*a*, eggs; *b*, larvæ; *c*, adult; *e*, eggs, enlarged; *f*, sculpture of eggs; *g*, larva, enlarged; *h*, side view of greatly enlarged segment of larva; *i*, dorsal view of same; *j*, pupa, enlarged; *k*, beetle, enlarged; *l*, portion of elytron of beetle, greatly enlarged. (*After Riley.*)

*This article was published in July, 1895, in Station Bulletin 121. It is here reprinted in slightly amended form. As to authorship, while Messrs. Britton, Sturgis, Jenkins and Johnson have each contributed some paragraphs, the natural history and treatment have been mostly compiled from the writings of Messrs. Howard and Smith.

what hairy to the touch. It is at this stage that the insect is most destructive, eating off the delicate surface tissue of the leaves, and causing the latter to become shrivelled and brown, and eventually to fall from the tree. By the end of June or early in July the worms become full grown. They then crawl down or fall from the trees and, in crevices of the bark or soil or under grass and leaves, change to soft, yellowish pupæ, *j*. Ten days later the pupæ give rise to the adult insects, small yellowish beetles, *c*, *k*, about one-quarter of an inch in length, marked on the back with two black stripes. The beetles ascend the tree and for a month feed upon the remaining leaves, though the injury done by them is much less than that due to the worms. During August and the early part of September the beetles enter cracks or crevices, where they hibernate, remaining until late in May, when they gather upon the young leaves to deposit their eggs. In New England there appears to be but one brood during the season.

Methods of Extermination.—This insect can best be destroyed in the larval and pupal conditions. The larvæ (worms) are found in June and July upon the leaves, the pupæ in July upon the trunks of the trees and on, or in, the ground beneath the trees.

The best method of combatting the Elm Leaf-Beetle is to spray the foliage with an arsenical poison.

Lead arsenate is better for this purpose than Paris green* because it stays longer in suspension and is less injurious to foliage. It is easily prepared from eleven ounces of sugar of lead (lead acetate), four ounces of sodium arsenate,† and one hundred gallons of water.

Throw the sugar of lead by itself into an empty hogshead and add 99 gallons of water, stirring with a paddle so as to mix the whole thoroughly. In another vessel dissolve the sodium arsenate in one gallon of water. Finally mix the two liquids together by effectual stirring, when the lead arsenate will appear as a fine white powder. In using this mixture the lead arsenate must be kept uniformly in suspension by suitable agitation.

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[*] Both these dangerous substances contain arsenic and require caution in handling, but may be used without serious injury if not swallowed or introduced into wounds.

[†] To be had of Billings, Clapp & Co., Boston, for eight cents a pound in 25 pound quantities.

A serviceable spraying mixture may also be made by mixing one pound of Paris green and three pounds of lime with one hundred and fifty gallons of water. The lime should be newly slaked and strained free from grit or lumps.

If the Paris green is not kept uniformly mixed with the other materials, by thorough agitation of the entire contents of the tank, while spraying, it will partly settle to the bottom, and the last portions of spray will be likely to "burn" the foliage. The addition of two quarts of molasses or a little flour paste to these drenches will make the poison adhere to the foliage for a long time, thus rendering sufficient a smaller number of sprayings.

To reach the tops of high trees a powerful force pump and a long hose are necessary. The Douglas Palmetto spraying pump, manufactured by W. & B. Douglas, Middletown, Conn., is well adapted to this purpose when hand-power is employed. It should be mounted upon a cask and raised as high as possible above the ground. The discharge pipe should be a half-inch rubber hose, supported on a light pole, so that the spray can be directed well up into the trees.

While a few trees may be cared for by the use of a hand-pump, the many full-grown elms in our large villages and cities require much more powerful appliances.

In 1894, Mr. Stephen Hoyt, of New Canaan, Conn., had a steam spraying outfit* constructed, by the use of which the trees upon the estate of Stephen Hoyt's Sons have been treated for two seasons with success.

From their experience, kindly communicated and illustrated to us in all details, we are enabled to present the following plan of treatment by power, adapted for use on a large scale.

A portable steam engine of eight, ten, or more horse-power with a double-acting force pump and a tank of 300 or more gallons capacity, are mounted on a stout wagon with a platform large enough to accommodate the engineer.

The force-pump should be supplied with an indicator to show the water-pressure, and a number of outlets, two, four, or more, to connect with as many lines of hose as may be practicable. Suitable hose, guaranteed to stand 200 lbs. pressure to the inch and costing 12 cents per foot, may be got of the Mineralized Rubber Co., 18 Cliff st., N. Y. The Lightning Hose Coupling is recommended.

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* See Mr. Hoyt's letter, appended.

To each hose is attached a nozzle adapted for producing a fine spray. A good nozzle for use with power is the McGowen, made by J. J. McGowen, Ithaca, N. Y., costing $1.50. This with 180 lbs. steam pressure throws a shower of fine spray vertically through thirty feet or more of still air.

The tank, to be charged with the poison drench, should be provided with an agitator to keep the materials in the tank uniformly mixed. Through the kindness of Mr. Hoyt we are able to show pictures of his outfit in the accompanying plate.

Besides the horses needful to bring the apparatus into position, a driver who can operate the agitator, an engineer, four, six or possibly eight men to manage as many lines of hose, and an assistant to charge the tank, are the needful force.

A man with "creepers" ascends a tree, carrying a stout cord, and choosing a good position in a crotch, hauls up a line of hose and fastens it to a limb, so that, holding the hose near the end, he can direct the nozzle on all sides. The power being applied, the water, with the poison in suspension, is forced out of the hose in a shower of fine spray, which, by skillful handling of the nozzle, is quickly applied to all parts of the foliage. To avoid waste of liquid the spray is thrown for a moment only on any one point, one, two or three minutes, at the most, sufficing to finish work on large trees.

While two or more men are directing the spray into as many trees, the same number are climbing the adjacent trees, so that the engine and its attendants are fully occupied.

Two treatments are advisable, the first in May as soon as the leaves are half grown, in order to destroy the beetles before they deposit their eggs; the second in June or as soon as it is seen that the eggs which have been laid are hatching out. This is undoubtedly the most effective means of destroying the insect, and should be kept up for several years.

If, for any reason, the spraying of the trees is impracticable, efforts must be made to destroy the insects in the pupal condition on or beneath the trees. This is best done by the use of kerosene emulsion, which is made as follows: Dissolve one-half pound of common hard soap in one gallon of boiling water; to this soap solution, while still hot, add two gallons of kerosene, and churn violently for five minutes until a creamy emulsion results, p. 202. Mix this with nine times its bulk of cold water by stirring, and sprinkle the thus diluted emulsion over the ground through a watering-pot. The application, which is not injurious to grass, should be made in such a quantity as to saturate the soil where the pupæ exist. By carefully examining the ground, grass, fallen leaves, etc., beneath the trees, the pupæ can be found, and the proper time for applying the emulsion as well as the extent of ground demanding treatment can be ascertained. In this climate the soft, yellow pupæ will be found on the ground from the middle of June to the middle of July or later, according to the season. The emulsion should be applied as soon as they are observed and the application repeated if needful to destroy them. To be thoroughly effective, this method of destroying the pupæ must be practiced each year.*

It is well to scrape away the rough outer bark of the trees for some distance above the ground, as many pupæ are likely to be concealed in the crevices. The scrapings should be burned or drenched with kerosene.

The worms which descend the trunk of the tree to pupate may be easily and almost completely intercepted by a band of hay an inch thick and 8 inches wide, secured to the scraped trunk at convenient height from the ground, by aid of a 6 in. girth of cheap cotton cloth, which is first tacked by one end to the bark and after packing the hay under it around the tree, is fastened at the other end by pins.

As often as the hay gets stocked with worms and pupæ it should be removed and burned, adding kerosene, if necessary, and a new hay band put in its place. If in the process of removal, pupæ have dropped to the ground they may be killed with kerosene emulsion.

The following letter from Mr. Hoyt, addressed to the Director, in answer to a request for some particulars concerning his spraying outfit, will prove useful.

DEAR SIR:—In reply to yours would say, the boiler was made by Chas. W. Foster, in New Haven, and will generate steam sufficient to produce five or six h. p., at a pressure of 100 lbs. The cost was $200. The pumps were made by the Marsh Steam Pump Co., Battle Creek, Mich. We got two pumps, size BB, and intended to run them both for spraying. I had one arranged to feed the boiler and to spray also, but found this did not work satisfactorily, so bought

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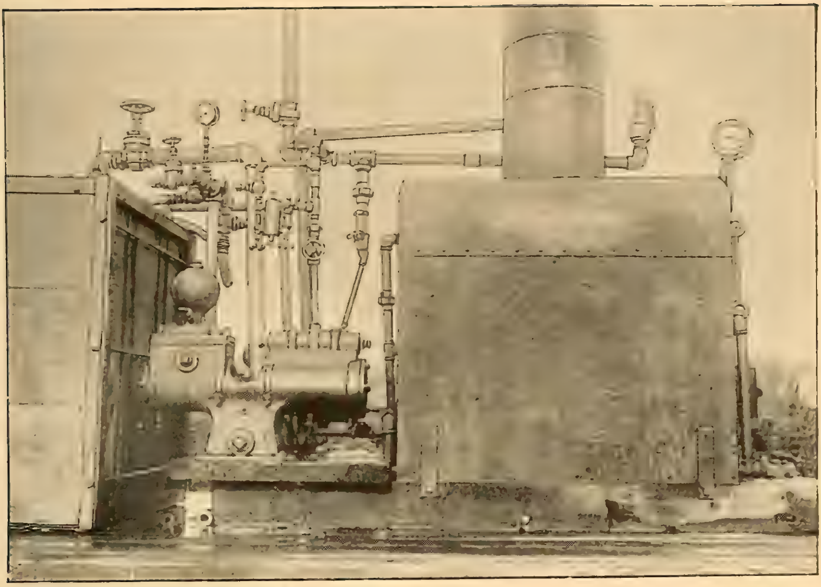
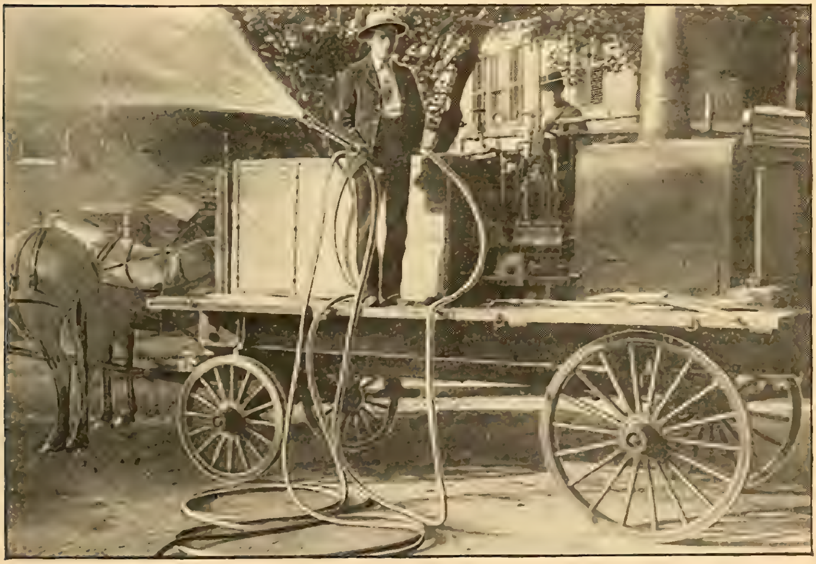
*While the touch of very little kerosene to the bodies of larvæ and young pupæ is fatal, the emulsion may fail to destroy hairy worms or older pupæ, because the hairs of the former or the chitinous coverings of the latter, shield the soft and vulnerable parts from actual contact with it.



Arrangement of Engine, Pumps and Tank, for Spraying Large Trees.



Engine throwing Spray under pressure of 150 pounds to square inch.

another, two sizes larger (size D), using the smaller pump for boiler feed only. The BB size is quoted at $50 less 50%. This is too large for a feed pump to a boiler of this capacity, and did we not have it, would have bought the smaller size, which is quoted at $30, less 50%.

Our 300 gallon tank was made by Geo. F. Johnson, New Canaan, Conn., and is partitioned off to hold 75 gals. of water to feed the boiler, and 225 gals. of mixture for spraying. This tank was bolted and ironed all through, and cost $40. Our hose, from the Mineralized Rubber Co., was ¾″; but we advise getting ½″ hose, as the strain is not so great, nor is it so heavy to handle. We used two lines of hose each 100 feet long. The McGowen nozzle does very good work, and is quite economical with the solution. We also found the Daisy nozzle, made in New Haven, excellent for tree spraying.

Although our boiler uses coal or wood for fuel, we bought it partly for another purpose, and would advise for spraying simply, to use a boiler heated by oil, as much more convenient. For a boiler feed-pump would suggest the Marsh, size B, and for spraying, a duplex high service pump, or one that would give a pressure of at least 150 lbs., such as are made by Worthington, Dean, Knowles or Snow.

The total cost of an outfit would average from $275 to $375, according to size.

Yours very truly,

STEPHEN HOYT, New Canaan, Conn.

ON A FRAUD IN MILK.

By E. H. Jenkins.

Four samples of milk, stated to have been supplied by a certain dairy, were sent to this Station, in June, 1895. They were tested with the following results:

	A.	B.	C.	D.
Specific Gravity	1.032	1.030	1.033	1.029
Solids, per cent.	11.09	10.47	11.36	9.68
Fat, per cent.	2.20	2.25	2.70	2.20
Solids not Fat, per cent.	8.89	8.22	8.66	7.48

The solids are below the normal average by one to three per cent. and the fat is too little by more than one per cent. These facts indicate removal of fat and addition of water; but the specific gravity is that of normal milk. Such exceptional milk might be the product of a single cow, perhaps, but that any herd of healthy animals can give such milk is contrary to all recorded experience.

The sender was advised to witness the milking of the herd and to send for analysis another fully authenticated sample.

Two days later we received two samples with the message:—"These two bottles were filled at the barn by a man who saw the whole process. He says he is sure there is no water in it." Examination of these samples gave the following results:

	A.	B.
Specific Gravity	1.0325	1.033
Solids, per cent.	11.00	11.29
Fat, per cent.	2.60	2.65
Solids not Fat, per cent.	8.40	8.64

We wrote, asking for the name and address of the witness present at the milking that we might get from him further particulars and an affidavit. In reply we were informed that the witness had since mentioned that "when the cows were about half milked, the calves were turned in to feed and finish the milking"!

The quality of these samples of "milk" is quite what would be expected under such circumstances.

It is well known that the portions of milk first drawn from the udder are watery and poor in fat and other solids, while the last portions are rich in solids and fat. The following figures by Bouchardat and Quevenne* illustrate the extent of this difference. The milk of three cows, I, II and III, which gave 20, 14 and 20 liters (quarts †) respectively, was examined with results as follows:

			Per cent.				
		Sp. Gr.	Water.	Fat.	Casein.	Sugar.	Total Solids.
I.	First Liter	1.034	89.51	1.40	3.87	5.18	10.45
	Last Liter	1.026	83.82	7.37	4.09	4.72	16.18
II.	First Half	1.034	88.47	1.79	4.12	5.62	11.53
	Last Half	1.031	86.61	4.36	3.96	5.07	11.39
III.	First Liter	1.031	89.81	0.85	3.64	5.70	10.19
	Last Liter	1.027	84.95	6.39	3.35	5.31	15.05

Harrington (Report of Mass. Board of Health for 1889, p. 189)* found in milk of a Jersey cow:

	Per cent.		
	Water.	Fat.	Total solids.
In "fore milk"	86.66	3.88	13.34
In "middle milk"	84.60	6.74	15.40
In "strippings"	82.87	8.12	17.13

Allowing calves to take a part of the milk is a common and, in itself, proper practice; but any one who sells the first of the milking as whole milk, grossly defrauds the purchaser. This case is interesting in calling attention to a possible dishonesty which is not always fully and certainly met by legislation.

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* Quoted from Zusammensetzung und Verdaulichkeit der Futtermittel, von Dietrich und König, pp. 837, 838.

† 100 liters equal 105 quarts.

OBSERVATIONS ON THE GROWTH OF MAIZE CONTINUOUSLY ON THE SAME LAND FOR EIGHT YEARS.

By E. H. Jenkins.

In the years 1888 and 1889 a parcel of land containing 1⅕ acres which had been a meadow for some years previous, was dressed with commercial fertilizers and planted to corn. Fertilizers and crops were weighed and analyzed each year and the enrichment of the soil by the dressing or its exhaustion by the cropping were determined as accurately as possible.

In the spring of 1890 this land was divided into four strips, each containing three-tenths of an acre, and was dressed as shown in the following diagram.

South.

Plot A.—Cow Manure at the rate of 10 cords per acre.

Plot B.—Hog Manure at the rate of 13½ cords per acre.

Plot C.—Fertilizer Chemicals at the rate of 1700 pounds per acre.

Plot D.—No manure or fertilizer of any kind.

North.

Corn was planted in drills four feet apart and the stalks stood singly at distances of ten inches in the drill. The crop from each plot was separately weighed and analyzed.

Since 1890 the several plots have annually received the same dressing and have been under the same conditions of planting, cultivation and harvesting as in that year.

Full particulars regarding the details of the experiment and the results obtained from year to year will be found in the Reports of this Station for 1890, pages 183 to 194; 1891, pages 139 to 149; 1892, pages 122 to 129; 1893, pages 286 to 300; 1894, pages 245 to 253.

In the following paragraphs are placed on record the results of the observations for the year 1895.

Discussion of the results is reserved.

Considering simply the gross amounts of nitrogen, phosphoric acid and potash which the dressing added to the soil of the several plots and those which the crops removed, it appears from Table VII, to be noticed later, that, after the crop of 1895 was harvested, there had been added to plot A *per acre, in excess of what had been taken off in crops,* 1148 pounds of nitrogen, 788 of phosphoric acid and 799 of potash, all from cow manure.

The corresponding enrichment of plot B consisted, *per acre,* of 1879 pounds of nitrogen, 3446 of phosphoric acid and 64 of potash, all from hog manure. The very large excess of phosphoric acid in the hog manure is due to the fact that the hogs were fed chiefly on hotel garbage, which contained a large quantity of bones of fowls.

The enrichment of plot C, *per acre,* amounted to 520 pounds of nitrogen, 972 of phosphoric acid and 177 of potash, all from fertilizer-chemicals.

Plot D received fertilizer-chemicals in 1888 and 1889, but in the following six years no dressing of any sort; so that after the harvest of 1895 it had acquired, *per acre,* 54 pounds more of phosphoric acid (from the applications of 1888 and 1889), than the crops had removed, but had lost 316 pounds of nitrogen and 66 pounds of potash.

Plot B also received more " organic matter " from the dressing than plot A, while plot C acquired only an insignificant amount in the dressing of fertilizer-chemicals, and plot D none at all.

Plot A receives annually about 3,207 pounds, plot B about 5,440 pounds and plot C not more than 200 pounds of organic matter.

GROSS YIELD OF THE PLOTS IN 1895.

Table I presents the gross weight of the kernels, cobs and stover harvested on each plot. Inasmuch as the kernels were air-dried on the cob, the weight of the latter in the field-cured condition could not be taken. Hence the weight of the kernels given in the table is slightly too high and that of the cobs slightly too low. But the error is small.

TABLE I.—GROSS YIELD OF THE PLOTS, POUNDS PER ACRE.

	Plot A. Cow Manure.	Plot B. Hog Manure.	Plot C. Chemicals.	Plot D. No Fertilizer.
Kernels	4890.5	5255.7	3895.0	2026.5
Cobs	674.5	684.3	560.0	268.5
Stover	7215.0	7950.0	4125.0	2235.0
Total	12,780.0	13,890.0	8580.0	4530.0

Since these crops contain a large and variable quantity of water, a strict comparison of the yields can only be made on the dry matter.

This appears in Table II.

TABLE II.—DRY MATTER OF THE CROPS, POUNDS PER ACRE. 1895.

	In Kernels.	In Cobs.	In Stover.	Total.
Plot A, cow manure	3155.4	602.3	3650.1	7407.8
Plot B, hog manure	3370.0	611.1	4032.2	8013.3
Plot C, fertilizer chemicals	2446.8	500.1	2428.4	5375.3
Plot D, no fertilizer	1186.5	239.8	1416.0	2842.3

During the last six years there has been no striking difference in the crops of these four plots, as far as the proportions of kernels, cobs and stover are concerned, unless perhaps the crop on D, which received neither fertilizers nor manure for six years, had a rather larger proportion of stover than the others. The figures are as follows :

TABLE II^a.—PERCENTAGE OF WATER-FREE KERNELS, COBS AND STOVER, IN THE CROPS. AVERAGE OF SIX YEARS.

	Plot A.	Plot B.	Plot C.	Plot D.
Kernels	44.2	44.3	45.4	42.5
Cobs	7.8	8.0	9.0	7.7
Stover	48.0	47.7	45.6	49.8
	100.00	100.00	100.00	100.00

Excess of nitrogen has not made the crop "run to leaves" nor has deficiency of plant food strikingly affected the relative proportion of ears and stalks.

The relative yields of dry matter from these plots for the last six years are given in Table III, the yield of plot A being marked in each case as 100.

TABLE III.—RELATIVE YIELD OF DRY MATTER FROM PLOTS A, B, C, D FOR SIX YEARS.

	Plot A.	B.	C.	D.
1890	100	104.7	89.5	73.5
1891	100	92.9	82.0	65.9
1892	100	114.6	98.3	48.9
1893	100	95.1	73.2	43.1
1894	100	95.6	96.9	66.9
1895	100	108.2	72.6	38.4
Average	100	101.8	85.4	56.1

It thus appears that during six years the two plots A and B, which were dressed with heavy applications of manure, have yielded on the average the same amount of water-free crop.

Plot C, dressed with fertilizer chemicals, supplying considerably more nitrogen, phosphoric acid and potash yearly than the crop removed, yielded on the average more than eight-tenths as much, and plot D, without fertilizers, yielded between five and six-tenths as much as plots A and B.

The relative yield on plot D fell steadily till 1894, when it rose very considerably, to drop again in 1895.

This would indicate that plot D suffered less from the prolonged drought of the summer of 1894 than the plots which had been dressed with manure for a term of years and which contained much more humus.

During five years there was a pretty regular falling off from year to year, in the yield of all four plots, as is shown in Table III^a, in which the yield of dry matter for each plot in 1890 is marked as 100; but in 1895 all the plots yielded more than in either of the two preceding years. In 1893 and 1894 crops, in this region generally, suffered more from drought than in 1892 or 1895.

TABLE III^a.—RELATIVE YIELD OF DRY MATTER IN THE SIX YEARS, 1890 TO 1895.

	Plot A.	Plot B.	Plot C.	Plot D.
1890	100	100	100	100
1891	96	81	83	81
1892	79	87	88	53
1893	58	53	48	34
1894	44	41	48	41
1895	82	85	67	43

The diminished yield of plot D is no doubt in part due to lack of plant food. In the other cases this cause cannot have been operative, except in reference to water supply.

YIELD OF EACH FOOD INGREDIENT.

In Table IV are given the quantities, in pounds per acre, of each food ingredient harvested from the four plots in 1895.

The cobs were not analyzed, but as their amount is relatively very small, the average composition of cobs as determined in other analyses, is used for the calculation.

TABLE IV.—YIELD OF FOOD INGREDIENTS IN POUNDS PER ACRE. 1895.

	PLOT A.				PLOT B.				PLOT C.				PLOT D.			
	Kernels.	Cob.	Stover.	Total.	Kernels	Cob.	Stover.	Total.	Kernels.	Cob.	Stover.	Total.	Kernels.	Cob.	Stover.	Total.
Water	1735.1	72.2	3564.9	5372.2	1885.7	73.2	3917.8	5876.7	1448.2	59.9	1696.6	3204.7	840.0	28.7	819.0	1687.7
Ash	41.1	9.4	232.3	282.8	52.0	9.6	288.6	350.2	31.5	7.8	127.9	167.2	15.4	3.8	63.0	82.2
Albuminoids	370.2	16.2	257.6	644.0	411.0	16.4	267.1	694.5	282.3	13.4	144.4	440.1	109.4	6.4	65.9	181.7
Fiber	56.2	203.0	1222.2	1481.4	53.6	206.0	1400.8	1660.4	46.0	168.7	867.1	1081.8	22.5	80.8	485.0	588.3
Nitrogen-free extract	2525.5	370.3	1887.4	4783.2	2674.2	375.7	2019.3	5069.2	1963.1	307.4	1256.0	3526.5	982.5	147.4	782.0	1911.9
Fat	162.4	3.4	50.6	216.4	179.2	3.4	56.4	239.0	123.9	2.8	33.0	159.7	56.7	1.4	20.1	78.2
	4890.5	674.5	7215.0	12,780.0	5255.7	684.3	7950.0	13,890.0	3895.0	560.0	4125.0	8580.0	2026.5	268.5	2235.0	4530.0

TABLE V.—COMPOSITION, PER CENT., OF FIELD-CURED MAIZE, KERNELS AND STOVER, FROM PLOTS A, B, C, D. 1895.

	Analyses of Field-cured Maize.						Calculated Water-free.				
	Water.	Ash.	Albuminoids.	Fiber.	Nitrogen-free Extract.	Fat.	Ash.	Albuminoids.	Fiber.	Nitrogen-free Extract.	Fat.
KERNELS.											
Plot A	35.48	.84	7.57	1.15	51.64	3.32	1.30	11.73	1.78	80.04	5.15
Plot B	35.88	.99	7.82	1.02	50.88	3.41	1.54	12.19	1.59	79.36	5.32
Plot C	37.18	.81	7.25	1.18	50.40	3.18	1.29	11.55	1.88	80.22	5.06
Plot D	41.45	.76	5.40	1.11	48.48	2.80	1.30	9.23	1.90	82.79	4.78
STOVER.											
Plot A	49.41	3.22	3.57	16.94	26.16	.70	6.38	7.05	33.49	51.69	1.39
Plot B	49.28	3.63	3.36	17.62	25.40	.71	7.16	6.63	34.75	50.06	1.40
Plot C	41.13	3.10	3.50	21.02	30.45	.80	5.24	5.95	35.71	51.75	1.35
Plot D	36.65	2.83	2.95	21.68	34.99	.90	4.47	4.66	34.23	55.22	1.42

The yield of each food ingredient from the four plots shows, in general, differences like those already noted in respect to the yield of total dry matter.

Table V shows the composition of the crops on the four plots, A, B, C and D, for the year 1895.

Table VI exhibits the striking differences in the percentage composition of the crop on the four plots calculated from the average of six years.

The crops, both of kernels and stalks, on A and B, which have been very heavily dressed each year, the one with cow manure, the other with hog manure, are practically identical as regards chemical composition.

The kernels of the crop on C, which receives each year a liberal dressing of fertilizer chemicals, 1500 pounds to the acre, contains in the kernels somewhat less ash or mineral matter and fat, and half a per cent. less of proteids, etc.,* than the crops on A and B, with correspondingly more nitrogen-free extract. Similar differences are found in the composition of the stalks.

The kernels in the crop on D, to which no fertilizer or manure has been applied since 1889, have 2.3 per cent. less proteids, etc., than that of plots A and B, somewhat less ash and fat, but more fiber and nitrogen-free extract.

TABLE VI.—AVERAGE COMPOSITION OF THE DRY MATTER OF KERNELS AND STOVER OF CROPS OF 1890, 1891, 1892, 1893, 1894 AND 1895.

KERNELS.

	Ash.	Proteids, etc.*	Fiber.	Nitrogen-free Extract.	Fat.
Plot A	1.35	11.50	1.74	80.16	5.25
Plot B	1.48	11.61	1.64	80.00	5.27
Plot C	1.28	11.08	1.81	80.74	5.09
Plot D	1.27	9.38	1.88	82.62	4.85

STOVER.

	Ash.	Proteids, etc.*	Fiber.	Nitrogen-free Extract.	Fat.
Plot A	6.59	6.73	33.15	52.09	1.44
Plot B	6.81	6.63	33.67	51.43	1.46
Plot C	5.87	6.30	34.21	52.24	1.39
Plot D	5.21	5.34	33.50	54.51	1.44

To complete the data regarding this experiment two other tables are presented.

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* i. e. Nitrogen reckoned as proteids (including albumin, globulin, zein) and also amides and other compounds of nitrogen.

Table VII gives the quantities of nitrogen, phosphoric acid and potash which were added in the manure or fertilizers and remained in the crops of 1895.

It also gives the amounts of those fertilizing materials which have been added to the soil capital (+) or withdrawn (—) in the eight years during which accurate account has been kept.

Table VIII gives the record of the crops on the four plots for the whole period covered by the experiment and also the percentage composition of the several crops.

TABLE VII.—ENRICHMENT OR IMPOVERISHMENT OF SOIL BY EIGHT YEARS' MANURING AND CROPPING WITH INDIAN CORN. POUNDS PER ACRE.

	Cow Manure. Plot A.			Hog Manure. Plot B.			Fertilizer Chemicals. Plot C.			No Fertilizer. Plot D.		
	Nitrogen.	Phos. acid.	Potash.	Nitrogen.	Phos. acid.	Potash.	Nitrogen.	Phos. acid.	Potash.	Nitrogen.	Phos. acid.	Potash.
After seven years' cropping	+934.6	+680.7	+711.7	+1571.0	+2898.0	+101.3	+418.6	+831.4	+158.7	−287.5	+65.4	−54.3
Applied in 1895	286.3	136.4	204.5	419.9	586.5	72.4	172.0	162.0	69.0	00.0	00.0	00.0
Taken off in Crop of 1895	103.0	29.0	117.1	111.1	38.5	109.8	70.4	21.8	50.3	29.1	11.6	11.7
Excess (+) or Deficiency (−) after eight years' cropping	+1117.9	+788.1	+799.1	+1879.8	+3446.0	+63.9	+520.2	+971.6	+177.4	−316.6	+53.8	−66.0

TABLE VIII.—YIELD OF DRY MATTER AND "SHELLED CORN" PER ACRE FOR EIGHT YEARS AND COMPOSITION OF DRY MATTER.

	Year.	Distance of Planting.	Pounds of Dry Matter per Acre.	Bushels of Shelled Corn.	Percentage Composition of Dry Matter				
					Ash.	Proteids, etc.*	Fiber.	Nitrogen-free Extract.	Fat.
Fertilized alike with chemicals	1888	Stalks 12 inches apart.	7350	75	3.3	7.8	19.4	66.1	3.4
	1888	" 6 " "	7980						
	1889	" 12 " "	6144	60	3.5	6.1	21.7	69.7	3.0
	1889	" 6 " "	6353						
Cow Manure	1890A	" 10 " "	9014	91	4.0	7.9	19.8	65.7	2.6
Hog Manure	1890B	" 10 " "	9436	97	4.2	8.0	19.6	65.5	2.7
Fertilizer Chemicals	1890C	" 10 " "	8070	87	3.9	8.0	21.2	64.4	2.5
No Manure or Fertilizer	1890D	" 10 " "	6626	51	3.8	6.2	20.7	66.7	2.6
Cow Manure	1891A	" 12 " "	8176	103	3.2	7.5	15.5	70.2	3.6
Hog Manure	1891B	" 12 " "	7599	88	3.3	7.6	16.2	69.3	3.6
Fertilizer Chemicals	1891C	" 12 " "	6708	70	3.2	6.4	18.5	68.8	3.1
No Manure or Fertilizer	1891D	" 12 " "	5391	60	3.1	6.0	17.4	70.2	3.3
Cow Manure	1892A	" 12 " "	7181	72	4.0	8.2	19.6	65.1	3.1
Hog Manure	1892B	" 12 " "	8233	84	4.0	8.8	19.3	64.8	3.1
Fertilizer Chemicals	1892C	" 12 " "	7062	86	3.2	8.3	17.5	67.8	3.2
No Manure or Fertilizer	1892D	" 12 " "	3509	38	3.3	7.7	18.8	67.2	3.0
Cow Manure	1893A	" 12 " "	5277	53	4.3	8.8	20.8	63.3	2.8
Hog Manure	1893B	" 12 " "	5020	52	3.8	8.4	21.1	63.9	2.8
Fertilizer Chemicals	1893C	" 12 " "	3858	37	3.8	9.0	21.6	63.0	2.6
No Manure or Fertilizer	1893D	" 12 " "	2277	18	4.6	8.2	22.5	62.4	2.3
Cow Manure	1894A	" 12 " "	4021	42	4.3	9.0	18.8	64.5	3.4
Hog Manure	1894B	" 12 " "	3845	40	4.2	9.2	18.1	65.2	3.3
Fertilizer Chemicals	1894C	" 12 " "	3898	42	4.3	8.7	18.2	65.5	3.3
No Manure or Fertilizer	1894D	" 12 " "	2691	27	3.6	7.2	20.0	66.2	3.0
Cow Manure	1895A	" 12 " "	7408	75	3.8	8.7	20.0	64.6	2.9
Hog Manure	1895B	" 12 " "	8013	80	4.4	8.7	20.7	63.2	3.0
Fertilizer Chemicals	1895C	" 12 " "	5375	58	3.1	8.2	20.1	65.6	3.0
No Manure or Fertilizer	1895D	" 12 " "	2842	28	2.9	6.4	20.7	67.3	2.7

POULTRY FOODS.

The following brands of Poultry Food were sent to this Station for examination by J. S. Adam, of Canaan:

4516. Bradley's Superior Meat Meal, stated to be made of beef, blood and bones. Made by the Bradley Fertilizer Co., Boston, Mass.

4517. Bowker's Animal Meat, stated to be made from fresh beef and fresh bones, which are dried and cooked by steam and then ground. Made by the Bowker Fertilizer Co., Boston, Mass.

4518. Breck's Poultry and Swine Meal. "In addition to the pure meat and bone we have combined in this preparation some of the most potent agents known for the production of eggs, not by stimulating, but rather by preventing disease and promoting general good health," etc. Made by Joseph Breck & Sons, 47 N. Market St., Boston, Mass.

4519. C. A. Bartlett's O. K. Feed. Stated to be made of material daily collected from the city butcher markets and cooked while perfectly fresh. It is then pressed, dried by steam heat and ground fine. Made by C. A. Bartlett, Worcester, Mass.

4520. Smith & Romaine's Boiled Beef and Bone. Made by Smith & Romaine, 109 Murray St., N. Y. City.

The samples were purchased from the manufacturer with the exception of **4517**, which was bought of Ives & Pierce, Canaan, Conn.

ANALYSES.

	Bradley's.	Bowker's.	Breck's.	Bartlett's	Smith & Romaine's
	4516	**4517**	**4518**	**4519**	**4520**
Moisture	5.03	4.81	12.86	4.69	5.13
Fat	11.37	11.50	10.95	11.50	13.75
Protein *	36.62	41.75	29.81	40.68	38.00
Other Volatile and Organic Matters	3.72	4 49	4.90	5.49	5.15
Phosphate of Lime†	36.89	30.82	25.50	31.23	33.38
Sand and Soil	1.76	2.32	1.25	.57	1.03
Other Mineral Matters	4.61	4.31	14.73	5.84	3.56
	100.00	100.00	100.00	100.00	100.00
*Containing Nitrogen	5.86	6.68	4.77	6.51	6.08
†Containing phosphoric acid	16.86	14.11	11.67	14.29	15.27

The "protein" is calculated by multiplying the nitrogen found, by the factor, 6.25.

All the preparations appear to consist chiefly of meat and bone having about the composition of "bone tankage," which is used as a fertilizer.

They are quite alike in composition excepting that Breck's Poultry and Swine Meal contains less protein and phosphate of lime than either of the others, and correspondingly more moisture and mineral matters, which consist in part of carbonate of lime.

ANALYSES OF FEEDING STUFFS.

Maize Kernel.

5443. Bloody Butcher Corn, a 16-rowed, red dent variety, grown in Guilford, from seed brought from Iowa. "It grows two feet higher here than at the west."

5442. Hearst Corn, a 14-rowed yellow dent, grown in Guilford, from Iowa seed.

5441. Early Sciota Corn, a 14-rowed dent, grown in Guilford.

The three samples just named were brought to the Station by Richard Wilcox, of Guilford. Analyses are given on page 231.

The Bloody Butcher variety contains decidedly more protein and correspondingly less nitrogen-free extract than the other two.

The sample of early Sciota corn contains less protein and more starch than corn of average composition. Fertilizers, climate and rate of planting all affect the composition of the maize kernel and probably have more effect than any differences of variety.

By fertilization, variations in weather conditions in a given locality during a course of years and rate of planting, greater differences may be caused in the composition of a single variety of maize kernel, than will be found in the composition of different varieties of dents or flints raised for a course of years under like conditions.

Gluten Meal and Gluten Feed.

These are bye-products of the manufacture of corn-starch and glucose:

4487. King Gluten, granulated. Sent by R. E. Holmes, West Winsted. Cost $22.00 per ton.

4529. King Gluten, ground fine. Sent by Horace Burr, Winchester, to ascertain if it was pure.

5603. Gluten Meal. Made by Chicago Sugar Refining Co. Cost $14.75 in car lots.

5617. Atlas Gluten Feed. Made by Chicago Sugar Refining Co. Cost $15.50 in car lots.

5604. Gluten Meal. Made by National Starch Works, of New York City. Cost $15.50 per ton in car lots.

5605. Gluten Meal. Sold by Stein, Hirsch & Co. Hammond, Ill. Cost $14.90 per ton in car lots.

Nos. 5603, 5617, 5604 and 5605 were sampled and sent by T. A. Stanley, New Britain.

4488. Buffalo Gluten Feed. Sent by R. E. Holmes, West Winsted. Cost $19.00.

4486. Gluten Feed. Sold by Horace Burr, Winchester. Sent by R. E. Holmes, West Winsted. Cost $18.00.

The analyses given on page 231, show that the protein of "Gluten Feed" now ranges from 37 per cent. down to 17.8 per cent.

5603. Chicago Gluten Meal is the clear "gluten" from the settling tanks, containing little oil, but over 40 per cent. protein, only three per cent. less of this ingredient than cotton seed. The two feeds have about the same place in a cattle ration.

5604 and **4487** appear to consist of "gluten," mixed with maize "chits" or germs* which are rich in oil, thus lowering the per cent. of protein about two per cent. but increasing the fat to nearly 20 per cent. In general, feeds containing so large a proportion of fat are not easy to combine with others in a balanced ration.

5647. Contains besides gluten, the corn hulls, as shown by the larger per cent. of fiber, and probably also the chits.

"Buffalo Gluten Feed," **4488,** made by the American Glucose Co., of Buffalo, consists of all the parts of the kernel except the starch, which has been removed for conversion into glucose. It consists therefore, of the hulls, gluten, chits and oil, and has from year to year a pretty uniform composition.

WHEAT BRAN.

4505 and **4504.** Sent by W. H. Olcott, South Manchester, to learn which was the more concentrated feed. **4505** appeared to him to contain much less "middlings" (starchy matter?) than 4504.

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* In some manufactories a good share of the oil is extracted from the chits before the latter are mixed with the gluten.

The analyses show that **4505** contains 3½ per cent. more protein, 1½ per cent. more each of fat and of mineral matter, and 3¾ per cent. more of fiber than the other sample, but some 9 per cent. less of non-nitrogenous extract (starch).

Rice Flour.

4496 and **5510** are samples of refuse rice flour sold at the South for cattle food. Sampled and sent by Joseph D. Weed, Noroton, one sample in January, the other in November. The samples have the composition of a mixture of rice flour or "polish" with rice hulls. They contain about the same per cent. of protein as maize kernel with considerably more fiber and fat.

Miscellaneous Feeds.

5268. Barley Feed. Sent by W. H. Olcott, South Manchester. This contains over two per cent. more of protein and 7 per cent. more of fiber than maize kernel, the same amount of fat, but 10 per cent. less of nitrogen-free extract.

4566. Rye Bran. Sent by E. C. Birge, Southport.

The cows fed on this appeared to dislike it from the first and in two or three days after being put on the feed the herd, with one or two exceptions, were badly scoured and the milk-yield sunk one-third.

The determination of protein showed the average amount for rye bran, and we were unable to find anything which could explain the effects attributed to it.

4479. "Cattle Feed." A mixed feed, sold by C. A. Parsons, Boston, Mass., for $15.00 per ton in Boston.

The printed circular accompanying it claims for the feed that it is richer than shorts, "and contains the most nourishment for the money of anything you can buy, and no mistake."

It cost, delivered at East Bolton, $17.40 per ton, and was sampled and sent by A. H. Pomeroy, Coventry.

Assuming that this mixture contains no refuse material of any kind but is made of sound grain or mill products, it is not nearly as concentrated or "rich" a feed as wheat bran, as a comparison of the analyses in the table shows, and it is not worth as much by at least $2.00 per ton.

5508 and **4530.** Hall's Dairy Ration. The first-named sample was sent by W. H. Olcott, South Manchester. The second by Chas. T. Hotchkiss, West Cheshire. Cost in Cheshire, $22.00 per ton, delivered.

This claims to be made of "mill-feeds, gluten and cotton seed meal from the best of stocks and according to the analyses and tables of eminent men in the science of feeding cattle with the desired end in view of making a perfectly balanced ration."

The mixture contains about the same quantity of protein or "flesh formers" as wheat bran of average quality, twice as much fat and 7½ per cent. less of nitrogen-free extract.

The quantity of "ash" in Hall's Dairy Ration is large and more than one-quarter of it—2.37 per cent.—consists of sand and silica.

The intelligent dairyman can have but little use for ready-mixed rations of any sort. The grain and mill feed which he uses will be adjusted by him both in kind and in amount to balance the course fodder which he has on hand, and with greater economy and skill than by others whose business is selling feed and not dairying.

The dairymen's opportunities for informing himself regarding the compounding of rations are ample. His chances of detecting adulterations, or the mixtures of mill wastes of inferior value, are much better when he buys cotton seed, gluten and bran separately, each of which has a tolerably definite and constant composition, than when he buys a mixture of a number of feeds, with no such definite understanding as to its composition.

COST AND ANALYSES OF FEEDING STUFFS.

No.	Cost per Ton.	Kind of Feed.	ANALYSES.					
			Water.	Ash.	Protein.	Fiber.	Nitrogen-free Extract.	Fat.
5443	------	Maize Kernel, Bloody Butcher	11.00	1.43	10.50	1.27	71.38	4.42
5442	------	“ “ Hearst	10.60	1.34	8.87	1.15	73.79	4.25
5441	------	“ “ Early Sciota	11.95	1.05	8.12	1.50	72.82	4.56
		Gluten Meals and Gluten Feeds.						
4487	$22.00	King Gluten	7.25	.70	35.19	1.33	37.10	18.43
4529	------	“ “	------	------	36.25	------	------	------
5603	14.75*	Gluten Meal	8.02	1.05	40.50	2.08	41.28	7.07
5617	15.50*	Atlas Gluten Feed	5.93	1.85	37.37	11.69	28.08	15.08
5604	15.50*	Gluten Meal	6.75	.78	38.60	1.64	32.35	19.88
5605	14.90*	“ “	8.12	.85	30.81	1.68	48.09	10.45
4488	------	Buffalo Gluten Feed	7.44	.79	23.25	8.11	46.99	13.42
4186	18.00	Gluten Feed	6.09	.92	17.87	9.11	54.15	11.86
		Wheat Bran.						
4505	------	------	8.55	5.35	18.94	8.85	53.33	4.98
4504	------	------	10.07	3.65	15.37	5.13	62.28	3.50
		Rice Flour.						
4496	------	------	7.66	10.45	9.94	17.01	47.10	7.84
5510	------	------	7.69	9.28	10.38	14.76	48.13	9.76
		Miscellaneous Feeds.						
5268	------	Barley Feed	9.50	3.53	12.62	8.56	61.44	4.35
4566	------	Rye Bran	------	------	14.81	------	------	------
4479	17.40	“Cattle Feed”	9.24	3.78	12.12	7.80	63.44	3.62
5508	22.00	“Hall's Dairy Ration.”	9.35	8.50	18.06	7.90	45.76	10.43
4530	23.00	“ “ “	------	------	20.75	------	------	------

* Car lots.

THE CHEMICAL NATURE OF DIASTASE.

SECOND PAPER.

BY THOMAS B. OSBORNE AND GEORGE F. CAMPBELL.

In a former paper, by one of us, printed in the Eighteenth Annual Report of this Station, pp. 192–207, (also Jour. Am. Chem. Society, XVII, pp. 587–603,) the results of some attempts to isolate diastase have been detailed. This work has been continued, but as yet no preparations of diastase have been realized more active than those there described. The results given in the former paper, however, have been confirmed, and details of the process for obtaining highly active diastase have been determined more exactly.

Here follows a concise account of this later work so far as it is worth placing on record.

Fifteen kilograms of fine ground malt were treated with 30 liters of 5 per cent. sodium chloride brine, and after standing some time, with frequent stirring, the extract was pressed out and filtered, yielding 16 liters of clear filtrate. The meal residue was again treated with 15 liters of 5 per cent. brine and 15 liters more of clear extract obtained. The united solutions were then saturated with ammonium sulphate and the precipitate filtered out, dissolved in brine and filtered perfectly clear. This liquid was saturated with ammonium sulphate, the precipitate was suspended in two liters of water and dialyzed during two days. The ammonium sulphate which adhered to the precipitate, at first prevented solution of the substance, but after two days enough sulphate was removed by dialysis to allow the proteid to dissolve. The solution was filtered clear and dialyzed seven days longer. The globulin thus precipitated was filtered out and the solution, which measured 5800 c. c., was dialyzed into an equal volume of alcohol of 0.86 sp. gr. for 18 hours. The precipitate, VI,* was filtered out and the solution, which then measured 3500 c. c., was again dialyzed into an equal volume of alcohol of 0.86 sp. gr. for 18 hours, yielding precipitate VII. The filtrate from VII measured 2700 c. c. and was dialyzed into an equal volume of alcohol of 0.86 sp. gr. for 18 hours, giving precipitate VIII, the filtrate from which measured 2000 c. c. and was dialyzed into 2500 c. c. of alcohol of 0.82 sp. gr. for 18 hours. This gave precipitate IX, the filtrate from which measuring 1800 c. c. was dialyzed into twice its volume of alcohol of 0.81 sp. gr., giving precipitate X. The solution filtered from X was then treated with absolute alcohol until nothing further separated, giving precipitate XI.

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* The precipitates and preparations described in this paper are numbered consecutively with those specified in the former article on Diastase.

These six fractions were all, separately, treated with water; X and XI dissolved completely, the others partially. The aqueous solutions, filtered clear, containing the proteoses and albumin of the six fractions, were then separately dialyzed into water, to remove all freely diffusible substances and, as no globulin was precipitated from any of them, the dialyzers were transferred to alcohol, in order to concentrate their contents, and absolute alcohol was finally added until the proteids were completely thrown down.

In this way six preparations were obtained, which, when dehydrated with absolute alcohol and dried over sulphuric acid, weighed respectively, **18,** 1.37 gm.; **19,** 1.47 gm.; **20,** 4.05 gm.; **21,** 4.82 gm.; **22,** 2.17 gm.; and **23,** 0.63 gm.

The diastatic power of these preparations was determined in the manner described in the former paper (Report of this Station for 1894, p. 194) and found to be as follows: **18**=0; **19**=60; **20**=300; **21**=300; **22,** trace; and **23**=0.

It will be noticed that nearly all the enzyme was thrown down in fractions VIII and IX, which gave preparations **20** and **21.** These were but half as active as preparation **15,** described in the former paper.

In order to purify this diastase, **20** and **21** were united, dissolved in 100 c. c. of water, the insoluble matter filtered out and washed with 35 c. c. of water (these first washings being added to the filtrate), then with more water, and finally with absolute alcohol. Dried over sulphuric acid, this preparation, **24,** weighed 0.53 gm. The filtrate and first washings from **24** were treated with 200 c. c. of alcohol of 0.885 sp. gr., making a solution containing 36.5 per cent. of alcohol. A small precipitate resulted, **25,** which when filtered out and dried over sulphuric acid, weighed 0.25 gm. and had a diastatic value of 15. The filtrate from this precipitate was mixed with 160 c. c. of alcohol of 0.84 sp. gr., raising the per cent. of alcohol to 50.7, and the precipitate, **26,** thus produced when dried as usual weighed 2.35

gm. and had a diastatic value of 86. To the filtrate from **26** 100 c. c. of alcohol of 0.84 sp. gr. and 100 c. c. of absolute alcohol were added, raising the alcohol-content to 61.6 per cent. The precipitate, **27,** which resulted, was filtered out, weighed 2.87 gm. and had a diastatic value of 600, just twice that of **20** and **21,** from which it had been derived, and just equal to that of the most active preparation, **15,** of the former paper. To the filtrate 200 c. c. of absolute alcohol were added, giving a precipitate, **28,** which weighed 1.00 gm. and had a diastatic value of 100.

The filtrate from **28** mixed with 200 c. c. more of absolute alcohol, gave a precipitate, **29,** which weighed 0.40 gm. and showed only a trace of diastatic power. The filtrate from **29,** mixed with 400 c. c. of absolute alcohol, yielded 0.17 gm. of substance, **30,** that was totally inactive, and the filtrate from this when evaporated to dryness left a residue weighing 0.65 gm.

The results of this experiment showed that little diastase was precipitated by bringing the alcohol-content of the malt-extract to 50 per cent. by weight, while nearly all the diastase was thrown down, under the conditions described, when the proportion of alcohol in the malt-extract was made 60 per cent.

In order to still further concentrate or purify the diastase contained in precipitate **27,** this was treated with 100 c. c. of water and, without filtering from the substance which had been coagulated by precipitation and drying, 100 grams of absolute alcohol were added. The precipitate so produced was filtered out and extracted with water. The insoluble matter, after washing and drying, weighed 0.50 gm. The aqueous filtrate, from this insoluble matter, was then completely precipitated with absolute alcohol and 0.45 gm. of substance, **31,** obtained having a diastatic value of 200. The solution, filtered from the first precipitate, produced by adding an equal weight of alcohol to the solution of **27,** as just described, was mixed with enough absolute alcohol to raise this ingredient to 50 per cent. and the substance thereby thrown down, **32,** weighed when dry 1 gm. and had a diastatic value of 400. The filtrate from **32** was completely precipitated with absolute alcohol and yielded 0.2 gm. of inactive proteid. It is thus seen that the diastase instead of increasing in power under this treatment declined to two-thirds of its original activity.

Having thus learned more exactly the conditions under which diastase may be so far separated from the other malt proteids, an attempt was made to prepare a large quantity of material with which to carry the purification farther. Through the kindness of Mr. C. Von Eggloffstein, of the Maltine Manufacturing Company, at Yonkers, N. Y., a considerable supply of malt-extract, rich in diastase, was placed at our disposal. For this favor and much information respecting malt-extracts, we wish to express our especial thanks.

One gallon (3.785 c.c.) of this malt-extract, which had been concentrated at a low temperature *in vacuo* until it contained about 50 per cent. of solid matter, was dialyzed into water for 48 hours, whereby a large part of the sugar was removed and a thin liquid remained. This was saturated with ammonium sulphate and the precipitated proteids were filtered out, suspended in water and dialyzed for five days. To the liquid contents of the dialyzer, filtered clear from insoluble matters, alcohol was added to make 50 per cent. of the resulting mixture. This threw down a precipitate which was filtered out, dehydrated with absolute alcohol and dried over sulphuric acid.

This white, easily powdered precipitate, XII, weighed 95 grams. One-half of it was insoluble in water and salt solution. By extraction with water and precipitation with alcohol, added first to 50 per cent. and afterwards to 60 per cent., two preparations, **33** and **34**, resulted, weighing respectively 4.85 gm., and 7.21 gm., that had little diastatic power.

The solution from which the first precipitate, XII, had been separated was treated with enough alcohol to make 75 per cent., and the resulting precipitate, XIII, filtered out and found to weigh, when dried over sulphuric acid, 70 grams. This precipitate included the chief part of the diastase of this extract. It dried to a light, dusty powder of pale straw-yellow color, almost entirely soluble in water and had a diastatic value of 200.

XIII was dissolved in water and fractionally precipitated, but, for some unknown reason, the resulting fractions were almost entirely inactive.

In another attempt to make a large quantity of diastase, 3 gallons (11.4 liters) of the highly concentrated malt-extract were mixed with half their weight of water and enough alcohol to make a mixture containing 46 per cent. of alcohol. A very large precipitate, XIV, resulted, which was filtered out and as it consisted almost entirely of insoluble matter (probably globulin), it was not further examined.

The filtrate from precipitate XIV was treated with alcohol, raising the strength to 60 per cent; the precipitate so produced was filtered out and, as it contained a large amount of sugar, it was dissolved in about five liters of water, the resulting solution was saturated with ammonium sulphate, the precipitate filtered out, suspended in one liter of water and dialyzed for five days. The precipitate in the dialyzer was filtered out and the clear solution was treated with alcohol sufficient to make 50 per cent. of the resulting mixture, but as only a little substance separated, the amount of alcohol was increased to 60 per cent. This threw down a considerable precipitate, XV, which, when dehydrated with absolute alcohol and dried over sulphuric acid, weighed 57 grams and had a diastatic value of 300.

Numerous attempts were made to obtain from portions of precipitate XV, by fractional precipitation with alcohol, diastase of greater power than 300, but without success.

Several hundred trials were made with the object to determine precisely the influence of certain conditions, such as the age of the diastase solution, and of certain substances, added in systematically varied quantities, especially sodium chloride, disodium orthophosphate, tripotassium orthophosphate, orthophosphoric acid, acetic acid and citric acid (using the amount of copper reduction as the measure of effect), but, while the results were decisive in some cases—e. g. citric acid, in the minutest quantities, always depressed or destroyed diastatic action—in the majority of instances, no such uniform results were attainable as would lead to safe conclusions in regard to the circumstances that insure a high degree of diastatic activity.

From our experience in testing these preparations it would seem that the purer the diastase is made, the more sensitive it is to external conditions, and that the method of testing the purity of the ferment by its maltose-producing power thus becomes of uncertain value and perhaps fails to furnish a safe criterion of the purity of the enzyme. That the proteid is not the only factor involved in the amylolytic action of diastase is indicated by the great influence on its activity that often accompanies the addition of various substances to its solution. In view of these facts it is not at all improbable that in thus attempting to purify diastase we remove some substance that favors, or is essential to its action, and that we may have in hand what may be properly termed the enzyme itself, which is feeble in its operation through the absence or deficiency of some accessory substance. Thus the addition of sodium chloride in many cases increases the diastatic action several fold. That the albumin is an essential factor in diastatic action could not be positively proved, but the results of further experience have tended to strengthen this belief. Of all the preparations that we have made, none from which albumin was absent showed amylolytic power, and those containing the most albumin were the most active. It was always possible to roughly judge of the diastatic power of a preparation, by heating a portion of its solution to 65° C. and observing the amount of coagulum formed.

The fact that active diastase was obtained only from solutions whose alcohol content lies between 50 and 60 per cent., may, we think, be regarded as probable evidence that the enzyme is not something carried down mechanically with the proteid.

JUNE, 1895.

THE PROTEIDS OF MALT.

By Thomas B. Osborne and George F. Campbell.

As is well known, water extracts a considerable quantity of proteid matter from ground malt. This we find to consist of at least five distinct bodies, namely, a globulin, an albumin and three proteoses. Whether true peptones are present was not determined, for the malt extracts are so strongly colored that the biuret test entirely fails. Besides the proteids soluble in water another exists that may be taken up by dilute alcohol (of 0.9 sp. gr.) After extracting malt with saline solutions and alcohol, a further quantity of proteid matter remains, the nature of which we have not been able to determine.

Malt-globulin.—Ten kilograms of air dried malt, freshly prepared by ourselves in the laboratory, and ground to a fine meal were treated with twenty liters of water and, after standing three hours, were squeezed out in a press and the solution filtered clear. The residual meal was treated with eight liters more of water and the second solution was pressed out and filtered. The united solutions were saturated with ammonium sulphate, the precipitate was suspended in about four liters of water and dialyzed for three days, when it dissolved, with the exception of a slight residue. In order to reduce its volume and separate impurities, the filtered solution was again saturated with ammonium sulphate, the precipitated substance was suspended in fifteen hundred cubic centimeters of water and dialyzed until the greater part of the ammonium sulphate had been removed, when the solution was filtered clear. The matters now remaining undissolved were treated with ten per cent. salt solution to extract any soluble globulin which might have been deposited during dialysis, and the substance not taken up in salt-solution was filtered out. This last unquestionably consisted almost entirely of insoluble globulin, but as it separated from an unfiltered solution and was small in quantity it was not further examined. The salt-solution was then dialyzed free from chlorides, and the globulin thus precipitated was filtered out, washed with alcohol and dried over sulphuric acid. But 0.5 gm. of substance was obtained which, dried at 110°, gave 0.93 per cent. of ash and, reckoned ash-free, 15.70 per cent. of nitrogen. This was marked preparation **1.**

The solution of the ammonium sulphate precipitate, containing the bulk of the malt-proteid, from which the insoluble matter yielding preparation **1** had been filtered, was dialyzed, first, into water, until the salts were mostly removed, and then into an equal volume of alcohol of 0.84 sp. gr. for forty-eight hours. The proteid thus precipitated was filtered out and the filtrate was dialyzed into alcohol. After filtering out the second precipitate, the filtrate was dialyzed into stronger alcohol, and this process was repeated, thus depositing the proteids in four fractions, a fifth being obtained by adding absolute alcohol to the remaining solution as long as anything was thrown down. Each of these five fractions was then treated with water to dissolve albumins and proteoses and the resulting solutions were dialyzed in water for several days. The first four fractions were but partly soluble in water, and accordingly, the insoluble parts, after washing with water, were treated with ten per cent. sodium chloride solution, and the portion which in each case remained undissolved was filtered out, washed thoroughly with water and alcohol and dried at 110° for analysis. The four saline extracts were then dialyzed, but those from the third and fourth fractions were found to contain only trifling quantities of proteids. That from the second fraction gave no precipitate of globulin on dialysis, but by adding alcohol to the solution 0.49 gram of preparation **2** was obtained, having 4.33 per cent. of ash and, calculated ash-free, 15.18 per cent. of nitrogen. The sodium chloride extract from the first fraction gave a precipitate on dialysis which, after washing with water and with alcohol, weighed 1.2 grams, **3.**

The filtrate from **3,** by precipitation with alcohol, yielded **4,** weighing 1.54 grams.

After extracting the four fractional precipitates with water and with salt solution, the undissolved residue, in each case, was washed thoroughly with salt solution, with water and with alcohol and dried over sulphuric acid, giving, in the order named, preparation **5** weighing 8.0 gm., **6** weighing 5.0 gm., **7** weighing 2.87 gm. and **8** weighing 0.9 gm. These preparations, dried at 110°, had the following composition :

MALT-GLOBULIN, BYNEDESTIN.

	3	4	5	6	7	8
Carbon	53.11	53.58	53.55	53.51	53.25	53.42
Hydrogen	6.45	6.70	7.01	6.75	----	7.15
Nitrogen	15.78	15.86 15.87	15.72	15.87	16.12	16.65
Sulphur } Oxygen	24.66	23.86				22.78
Sulphur			1.23	1.12	1.38	
Oxygen			22.49	22.75		
	100.00	100.00	100.00			100.00
Ash	0.75	1.43	1.09	0.66	0.55	0.24

Preparations **5** and **6** have the same composition as the globulin **3** and **4** obtained from the sodium chloride extracts of the fractional precipitates, while **8** contains nearly one per cent. more nitrogen, and as will be seen later, has nearly the same composition as malt albumin and is unquestionably for the most part albumin coagulated by the action of the alcohol. **7** appears to be a mixture of coagulated globulin and albumin. In a similar manner three other preparations of the coagulated globulin **9**, **10** and **11** were obtained from another lot of malt.

MALT-GLOBULIN, BYNEDESTIN.

	9	10	11
Carbon	52.90	52.99	53.15
Hydrogen	6.74	6.64	6.52
Nitrogen	15.33	15.31	15.81
Sulphur	1.17	25.06	1.47
Oxygen	23.86		23.05
	100.00	100.00	100.00
Ash	0.44	0.32	0.23

Preparations **9** and **10** are lower in carbon and nitrogen than those just described, probably because, having been prepared in a smaller quantity, they carried down a larger proportion of impurities when thrown out of solution by alcohol.

From a malt extract that had been concentrated *in vacuo* at a low temperature, for which we are indebted to Mr. C. von Eglofflstein, alcohol, added to make forty-six per cent. by weight of the mixture, threw down a large quantity of coagulated globulin that was not further examined, the filtrate from which, on increasing the content of alcohol to sixty per cent., gave a second precipitate that was largely soluble in water. It was accordingly mixed with water and with ammonium sulphate in excess, and the substance thus thrown down was suspended in a liter of water and dialyzed for five days. The insoluble residue in the dialyzer, when washed with water and alcohol, gave preparation **12**, weighing 26.78 grams. From this same extract by fractional precipitation with alcohol another small preparation of coagulated globulin, **13**, was obtained.

SUMMARY OF ANALYSES OF MALT GLOBULIN, BYNEDESTIN.

	1	**2**	**3**	**4**	**5**	**6**	**9**	**10**	**11**	**12**	**13**
Carbon			53.11	53.58	53.55	53.51	52.90	52.99	53.15	53.04	52.96
Hydrogen			6.45	6.70	7.01	6.75	6.74	6.64	6.52	6.57	6.83
Nitrogen	15.70	15.18	15.78	15.86	15.72	15.87	15.33	15.31	15.81	15.94	15.96
Sulphur					1.23	1.12	1.17		1.47		24.25
			24.66	23.86				25.06			
Oxygen					22.49	22.75	23.86		23.05	23.61	
			100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Although considerable differences exist among these analyses, they agree with each other as well perhaps as could be expected considering the difficulty of preparing the substance in a state of purity.

Whether other globulins occurred in the malt could not be determined by fractional precipitation owing to the small total quantity of globulin present.

The malt residue remaining after extracting with water, in the case first described, was treated with ten per cent. salt solution and the clear filtered liquid was dialyzed until free from chlorides. The precipitated globulin was filtered out, washed with water and alcohol and dried over sulphuric acid. This preparation, **14**, weighed 4.12 grams and had the following composition :

MALT-GLOBULIN, BYNEDESTIN.

		14	
	I.	II.	Average.
Carbon	52.94	52.78	52.86
Hydrogen	6.87	6.79	6.83
Nitrogen	16.16	16.18	16.17
Sulphur	1.14		1.14
Oxygen			23.00
			100.00
Ash	0.96		

It is to be noted that the carbon is a little lower and the nitrogen higher than the average of the figures previously obtained. This is perhaps due to presence of a little edestin,* the globulin of ungerminated barley. Edestin is not readily soluble in dilute saline solutions, such as are formed on treating seeds with water, and, if occurring in the malt, ought to be present in the salt extract of the meal after it has been exhausted with water. Owing to the incomplete extraction with water, the preparation obtained in this case should be a mixture of the two globulins, if both are present. Edestin can only occur in extremely small quantity in malt, since but 4.12 grams of globulin were obtained by extracting ten kilograms of malt with salt solution after treatment with water, and most of this consisted of the more soluble globulin first described. It is interesting to note the practically complete disappearance of edestin during germination and the formation of the more soluble globulin with three per cent. less nitrogen and two per cent. more carbon. It is, of course, not demonstrated that the malt globulin is derived from edestin, but that the proteids undergo extensive changes before conversion into proteoses and peptones is very evident.

When dissolved in considerable quantity in salt solution, bynedestin is precipitated by water, is not precipitated by saturation with sodium chloride, and but partly by saturation with magnesium sulphate. With the biuret test it gives a violet color. Dissolved in ten per cent. sodium chloride solution and heated to 65°, a turbidity is produced which increases to flocks at 84°. The coagulum gradually augments as the temperature rises but, after heating to 100°, the filtrate from the coagulum yields an abundant precipitate on adding dilute hydrochloric acid. The solution in ten per cent. sodium chloride brine gives a precipitate with acetic acid which is soluble in an excess of the acid. These reactions show that this body is in no sense a proteose, but has characters common to plant globulins. Bynedestin formed about sixty per cent. of the total water-soluble proteid matter in the malt extract first described in this paper. Out of a total of 33.27 gm. of proteid recovered in the different preparations from 100.00 gm. of malt, 19.88 gm. consisted of bynedestin.

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* Annual Report of this Station for 1894, p. 172, and Journal of American Chemical Society, vol. 17, p. 545.

Malt Albumin, Leucosin.—Under the name Leucosin, one of us has described an albumin occurring in small quantity in the seeds of wheat, rye and barley. In the aqueous malt-extracts an albumin is found identical with leucosin in properties and composition. As stated in previous papers, this albumin is so intimately associated with diastatic action as to make probable that it is either diastase itself or an essential factor in diastatic amylolysis. In attempts to fractionally separate malt-leucosin from the associated proteids, many preparations have been made which are mixtures of leucosin with proteose. In several cases these mixtures have been analyzed and have so nearly the composition of leucosin as to make certain that one of the proteoses of malt has very nearly the same ultimate composition as the albumin. Analyses of these mixtures may therefore be taken to represent the composition of either of these proteids.

In the extraction first described in this paper, two preparations, **15** and **16**, of albumin coagulated by alcohol, were obtained from solutions out of which the globulin had been precipitated by alcohol. If, as is invariably assumed, proteose cannot be rendered insoluble by contact with alcohol, these preparations may be taken to represent the composition of malt albumin. Their composition is here compared with that of leucosin coagulated by heat.

LEUCOSIN.

	Malt.		Wheat, Rye and Barley. Average.
	15	16	
Carbon	53.23	52.90	52.93
Hydrogen	6.64	6.79	6.80
Nitrogen	17.00	16.41	16.70
Sulphur			1.37
Oxygen	23.13	23.90	22.20
	100.00	100.00	100.00
Ash	0.84	0.55	

The following figures give the composition of preparations derived from three different samples of malt. These were all obtained by precipitating the proteids with ammonium sulphate, dissolving the precipitates in water, dialyzing away the greater part of the salt and fractionally precipitating the solutions with alcohol. The fractions were dissolved in water as far as possible, filtered from the undissolved globulin and the aqueous solutions dialyzed for several days in water and then in alcohol. The proteids thus precipitated were mixtures of proteose and albumin. It will be noted that they all agree fairly well with one another and with leucosin in composition. Since these mixtures contained from six and a half to fifty per cent. of albumin, it is evident that the two proteids have a very similar composition.

Malt Leucosin and Proteose.

	17	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Carbon	53.16	53.19	52.80	52.50	52.38	52.85	52.61	52.55
Hydrogen	7.03	6.71	6.96	6.72	6.63	6.67		
Nitrogen	16.50	16.60	16.09	16.10	16.51	16.25	16.35	16.41
Sulphur		1.38	1.45					
Oxygen	23.31	22.12	22.70	24.68	24.48	24.23		
	100.00	100.00	100.00	100.00	100.00	100.00		
Ash	0.84	0.78	0.59	0.66	1.55	0.22	0.51	

The preparations containing the most albumin, when dissolved in water, became turbid on heating to 50° and formed flocculent coagula at 58°. By saturating their solutions with magnesium sulphate the albumin was completely thrown out, and together with it much of the proteose. Saturating solutions of these preparations with sodium chloride, gave no precipitate when they contained but little albumin, but a heavy precipitate appeared on adding acetic acid to the salt-saturated solution. Solutions of the preparations containing much albumin gave precipitates on saturating with sodium chloride.

Proteoses of Malt.

The proteose associated with albumin has the properties of a *protoproteose*, since it is readily and abundantly precipitated from its salt-saturated solution on adding acetic acid.

When malt extract is fractionally precipitated with alcohol a considerable quantity of proteose is thrown down before the albumin, so that the water-soluble part of the first fraction is chiefly proteose. The proportion of albumin in the precipitates increases as the alcohol is made stronger up to the point where it is all precipitated. At this stage much proteose remains dissolved which behaves differently from that first thrown down. A large quantity of concentrated malt extract was precipitated by alcohol added to 60 per cent., and after filtering, the proportion of alcohol was raised to 72 per cent. The substance thereby precipitated, when dried over sulphuric acid, weighed 38 grams. This was dissolved in water, the solution was heated to boiling, the coagulated albumin was filtered out and 20 per cent. of sodium chloride added to the solution. This caused a slight precipitate which was evidently the alcohol-soluble proteid, to be described later. The filtrate from this substance was then treated with a little acetic acid, which produced a copious precipitate that was filtered out and dissolved in water. This solution, exactly neutralized with sodium carbonate and fully saturated with salt, yielded a considerable precipitate, which was filtered out, dissolved in water and dialyzed free from chlorides.

A very small deposit, consisting of minute spheroids, was found in the dialyzer. This dissolved readily in exceedingly dilute salt solution, from which it was thrown down by much water. On adding nitric acid to the solution of this substance a precipitate was produced that dissolved on warming and reappeared on cooling, gave a clear pink biuret reaction and was precipitated by copper sulphate. On boiling its solution not even a turbidity was produced. Except for its behavior on heating, this substance has all the reactions of a *heteroproteose.* The amount obtained was exceedingly small, only enough for the above reactions. The solution filtered from this heteroproteose was concentrated by gently boiling over a low flame.

During concentration of the solution filtered from the heteroproteose a coagulum developed as a film on the surface of the liquid and sides of the dish. We have frequently noticed that plant proteoses from various seeds coagulate in this manner although behaving in most other respects like typical proteose. This coagulum, **25,** filtered out, washed with water and alcohol and dried over sulphuric acid, weighed 0.29 gm. and contained 16.84 per cent. of nitrogen.

The filtrate from **25** was precipitated by alcohol and gave 1.45 gm. of **26,** having the following composition, when dried, at 110° :

Malt Proteose, **26.**

	I.	II.	Average.
Carbon	50.61	50.64	50.63
Hydrogen	6.72	6.61	6.67
Nitrogen	16.69		16.69
Sulphur Oxygen			26.01
			100.00
Ash			1.29

As will be remembered, in making these preparations, **25** and **26**, the proteose was precipitated, first, by adding acetic acid to the solution containing 20 per cent. of salt and, second, by dissolving the precipitate thus produced in water and saturating the neutralized solution with salt. The filtrate, **A**, from the first, as well as the filtrate, **B**, from the second precipitation, still contained proteose.

A was therefore neutralized with sodium carbonate and saturated with salt, but, as no precipitate resulted, acetic acid was added as long as any proteid was thrown down.

B was treated similarly with acetic acid and the two precipitates thus obtained from the salt-saturated solutions were collected on the same paper and the filtrates were united and marked **C**. The precipitates were dissolved in water, the solution carefully neutralized, dialyzed free from chlorides and then concentrated by slow boiling. During concentration a small coagulum separated which was filtered out, washed with water and alcohol and dried over sulphuric acid. This preparation, **27**, weighed 0.22 gm. and contained, without correcting for ash, 16.40 per cent. of nitrogen.

An excess of alcohol was added to the filtrate from **27**. and the precipitate produced, after treating in the usual manner, gave 1.49 gm. of preparation **28**, which, dried at 110°, had the following composition:

MALT PROTEOSE, **28**.

	I.	II.	Average.
Carbon	49.82	49.87	49.85
Hydrogen	6.69	6.64	6.67
Nitrogen	16.00		16.00
Sulphur Oxygen			27.48
			100.00
Ash			1.54

The salt-saturated filtrate, **C**, from which **27** and **28** had been precipitated, was neutralized and dialyzed until much of the salt had been removed, then concentrated and dialyzed until free from chloride. The solution was finally concentrated to small volume and precipitated with alcohol. The substance so obtained, after treating as usual, weighed 6.25 gm., but was found to contain 4.70 per cent. of ash and only 8.91 per cent. of nitrogen, reckoned ash-free. This precipitate, which was expected to contain *deuteroproteose*, evidently included much non-proteid matter.

It will be noticed that of the 38 grams of substance taken, only a very small part was recovered. It is probable that a large share of the substance (p. 246) was non-proteid, and also that during the dialysis much proteose was lost by diffusion.

Preparation **26** has the properties of a proto-proteose and may be regarded as such. Preparation **28** is a mixture of proto- and deuteroproteose. Pure deuteroproteose was not obtained, it having been impossible to separate the non-proteid substances associated with it.

It thus appears that at least two protoproteoses exist in malt, for **26** has much less carbon than the mixtures of proteose and albumin **17** to **24.** Preparation **17** contains about 95 per cent. of proteose and has 53.16 per cent. of carbon, whereas **26** has only 50.63 per cent. of carbon. This difference can scarcely be due to non-proteid impurities, for **26** contains even more nitrogen than **17**. According to the definitions now accepted, a protoproteose is any form of proteid which is soluble in pure water, uncoagulable by heat, precipitable by saturation with sodium chloride, and gives a pink biuret reaction and a precipitate with nitric acid that dissolves on warming and reappears on cooling. The protoproteoses obtained by artificial digestion, usually have a composition varying with that of the proteids from which they are derived, and the proteoses of malt may also be expected to differ according as they originate from one or another of the several proteids of barley. While the plant proteoses resemble the digestive proteoses in the reactions just specified, some of their physical properties are so different that it is not improbable that they are quite distinct substances.

MALT PROTEID SOLUBLE IN DILUTE ALCOHOL. BYNIN.

Three kilograms of ground malt were extracted with alcohol of 0.90 sp. gr. The extract was filtered clear, and concentrated to about one-third its original volume, on a water bath. When cool, the solution was poured off from the separated proteid and the latter was washed with dilute salt solution, with water, with ether to remove adhering water, and finally, with absolute alcohol. Dried over sulphuric acid, this preparation, **29**, weighed 33.1 gm., being 1.11 per cent. of the malt.

Dried at 110° it had the following composition :

Bynin, **29.**

	I.	II.	Average.
Carbon	55.01	54.93	54.97
Hydrogen	6.77	6.49	6.63
Nitrogen	15.98	16.13	16.06
Sulphur	0.94		0.94
Oxygen			21.40
			100.00
Ash			0.67

In order to fraction this substance, 27 grams were dissolved in alcohol of 0.90 sp. gr., the solution filtered perfectly clear, concentrated to small volume and poured into absolute alcohol, a few drops of ten per cent. salt solution being added to cause the proteid to separate. The precipitate so produced was filtered out, treated with absolute alcohol and dried over sulphuric acid. This preparation, **30,** weighed 20 gm., and when dried at 110° had the following composition :

Bynin, **30.**

	I.	II.	Average.
Carbon	54.74	55.08	54.91
Hydrogen	6.61	6.62	6.62
Nitrogen	16.21	16.06	16.14
Sulphur	0.83		0.83
Oxygen			55.07
			100.00
Ash			0.40

Of preparation **30,** 16 grams were dissolved in 180 c.c. of warm alcohol of 50 per cent. by volume, and a part of the proteid precipitated by cooling to 0° C. The solution was decanted and the precipitate, **30***a*, was treated as just described for **30.** The substance now separated, **30***b*, was treated in the same manner. **30***c*, thus obtained, was dissolved in a little strong alcohol and the perfectly clear solution poured into absolute alcohol, adding also a few drops of ten per cent. salt solution. The precipitate was then dehydrated with absolute alcohol and dried over sulphuric acid. This preparation, **31,** weighed 8.3 grams and gave the following results on analysis :

BYNIN, **31.**

	I.	II.	Average.
Carbon	55.07		55.07
Hydrogen	6.75		6.75
Nitrogen	16.18	16.42	16.30
Sulphur	0.84		0.84
Oxygen			21.04
			100.00
Ash			0.10

The solutions, containing 50 per cent. of alcohol, which had been decanted from 30*a*, 30*b* and 30*c*, were united, concentrated to small volume, cooled and the liquid poured off from deposited substance. The latter, dehydrated with absolute alcohol and dried over sulphuric acid—preparation **32**—weighed 5.0 grams.

As seen from the following table, these analyses show that the proteid has not been separated into fractions of differing composition.

SUMMARY OF ANALYSES OF BYNIN.

	29.	**30.**	**31.**	**32.**	Average.
Carbon	54.97	54.91	55.07	55.16	55.03
Hydrogen	6.63	6.62	6.75	6.67	6.67
Nitrogen	16.06	16.14	16.30	16.53	16.26
Sulphur	0.94	0.83	0.84	0.76	0.84
Oxygen	21.40	21.50	21.04	20.88	21.20
	100.00	100.00	100.00	100.00	100.00
Ash	0.67	0.40	0.10	0.16	

These figures are, except for hydrogen, in remarkably close agreement with those given by Chittenden and Osborne for the composition of zein, the alcohol-soluble proteid of maize; but in properties the two bodies are very distinctly different. Compared with hordein, the alcohol-soluble proteid of barley, this malt-proteid contains about one per cent. more carbon and one per cent. less nitrogen.

ALCOHOL-SOLUBLE PROTEIDS.

	Hordein, of Barley.	Bynin, of Barley-Malt.	Zein, of Maize.
Carbon	54.29	55.00	55.23
Hydrogen	6.80	6.67	7.26
Nitrogen	17.21	16.26	16.13
Sulphur	0.83	0.84	0.60
Oxygen	20.87	21.20	20.78
	100.00	100.00	100.00

MALT PROTEID INSOLUBLE IN WATER, SALT SOLUTION AND DILUTE ALCOHOL.

The proteid remaining undissolved, after extracting malt with water, salt solution and alcohol, was not separated or identified, but its presence in considerable quantity was shown, as follows:

After extracting 100 grams of malt, first, with ten per cent. sodium chloride solution and then, with alcohol of 0.90 sp. gr., dehydrating with absolute alcohol and drying in the air, a residue was obtained which weighed 75 grams and contained 0.82 per cent. of nitrogen, equivalent to 0.62 per cent. reckoned on the original malt. Assuming, as is probably true, that this nitrogen belongs to proteid matter, we have in the residue, 3.8 per cent. of proteid, insoluble in the reagents named.

SUMMARY.

In the malt used in this investigation we have found:

1. *Bynedestin*,[*] readily soluble in very dilute salt solution, therefore largely passing into the aqueous extracts because of the soluble salts of the seed. This globulin contains two per cent. more carbon and three per cent. less nitrogen than edestin, the globulin of barley, and is much more soluble in very dilute salt solutions than edestin.

The composition of this globulin, as shown by the average of eleven analyses, is:

BYNEDESTIN.

Carbon	53.19
Hydrogen	6.69
Nitrogen	15.68
Sulphur	1.25
Oxygen	23.19
	100.00

Bynedestin, dissolved in ten per cent. sodium chloride solution, gives a turbidity at 65° and a flocculent coagulum at 84°, but, even after heating for some time at 100°, the coagulation is far from complete.

This proteid is not precipitated by saturating its solutions with sodium chloride, and but partly precipitated by saturating with magnesium sulphate.

[*] From *βυνη*, malt and *εδεστὸς*, edible.

2. *Leucosin*, an albumin, identical in composition and properties with the leucosin found in wheat, rye and barley. The composition of this proteid was found to be:

MALT-ALBUMIN, LEUCOSIN.

Carbon	53.07
Hydrogen	6.72
Nitrogen	16.71
Sulphur Oxygen	23.50
	100.00

Leucosin is intimately associated with diastase*. Heated to 50°, solutions of this proteid become turbid, and at 58° a flocculent coagulum occurs. Coagulation, however, is incomplete unless the solution is heated for some time and the temperature raised to about 70°. Saturation with sodium chloride or with magnesium sulphate partly precipitates leucosin.

3. A *Protoproteose* readily precipitated from aqueous solution by adding an equal weight of alcohol. No preparations of this body were obtained free from albumin. Its composition is nearly the same as that of leucosin, since preparations containing from 90 to 50 per cent. of it, together with from 10 to 50 per cent. of leucosin, are not distinguishable by analysis.

4. A *Protoproteose* less readily precipitated by alcohol than the preceding, and of a different composition as shown by the following figures:

MALT-PROTOPROTEOSE.

Carbon	50.63
Hydrogen	6.67
Nitrogen	16.69
Sulphur Oxygen	26.01
	100.00

That this is not an impure preparation of the preceding, is indicated by the fact that the amount of nitrogen is alike in both, while the carbon differs by two per cent. This difference would probably not be caused by non-proteid impurities. It is possible that the deuteroproteose, next to be described, may not have been completely separated by the process employed.

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* See papers on Diastase, Annual Reports of this Station, 1894 pp. 202, 204 and 1895, p. 238.

5. A *Deuteroproteose* which could not be separated from non-proteid impurities.

6. A *Heteroproteose* in extremely small amount.

7. *Bynin* a proteid insoluble in water and saline solutions, but readily soluble in dilute alcohol. About 1.25 per cent. of this proteid was obtained from the malt, having the following composition:

BYNIN.	
Carbon	55.03
Hydrogen	6.67
Nitrogen	16.26
Sulphur	0.84
Oxygen	21.20
	100.00

8. A proteid insoluble in water, in salt solution and in alcohol, amounting to 3.80 per cent. The composition and properties of this proteid we have been unable to determine.

PROPORTIONS OF THE VARIOUS PROTEIDS IN MALT.

Assuming 21 per cent. of the total nitrogen of the malt to exist in non-proteid bodies, and admitting the malt proteids to contain on the average 16.3 per cent. of nitrogen, we have, in the malt investigated, a total of 7.84 per cent. of proteids.

As already indicated, p. 251, proteid equal to 3.8 per cent. of the malt was insoluble in alcohol and in salt solution.

It was shown on page 248 that 1.11 per cent. of proteid was recovered from alcohol solution, and making allowance for loss, we may place the amount of alcohol soluble proteid at 1.25 per cent.

Subtracting the sum of the insoluble proteid and the alcohol soluble proteid from the total malt proteids, we have 2.79 per cent. for proteids soluble in salt solution, viz: globulin, albumin, and proteoses.

The amount of coagulable proteids was found to be 1.50 per cent., consisting of albumin and a part of the globulin. There remains then 1.29 per cent. for the uncoagulated globulin and the various proteoses. We have accordingly, in the malt used for these determinations, approximately:

		Per cent.
Proteid, insoluble in salt solution and in alcohol		3.80
Bynin, soluble in dilute alcohol		1.25
Bynedestin, leucosin and proteoses soluble in water and salt solution	Coagulable	1.50
	Uncoagulable	1.29
Total proteids		7.84

The results of this study show: that, in germination, the proteids of barley undergo extensive changes without acquiring, or before acquiring the properties of proteoses; that hordein disappears and an alcohol soluble proteid of entirely different composition takes its place; that edestin also disappears and a new globulin is formed very different both in composition and properties. The albumin, on the other hand, appears to be unchanged in its characters, but its quantity is increased. It is to be noted also that hordein and edestin are both replaced by proteids much richer in carbon and poorer in nitrogen.

THE PROTEIDS OF THE POTATO.

By Thomas B. Osborne and George F. Campbell.

So far as we can ascertain, the only investigations of the proteids obtained from the tubers of the potato have been made by Rüling (Liebig's Annalen LVIII, 306), Ritthausen (Pflüger's Archiv XXI, 101), Zöller (Ber. d. Deutsch. Chem. Ges. XIII, 1064), and Vines (Journal of Physiology, vol. 3, p. 93).

Rüling contributes a partial analysis of the coagulum obtained by boiling the juice of the potato.

Ritthausen states that nearly the whole of the proteid of the potato is contained in the juice. He obtained two preparations from the juice by heating to 65° C., filtering off the coagulum and heating the filtrate to 76°. The two coagula were analyzed with results as stated beyond. He says "these results do not contradict the assumption that the potato contains albumin, yet the content in sulphur is only one-half as great as in albumin of serum egg and muscle.

Zöller extracted the pressed and washed potato pulp with ten per cent. sodium chloride brine and obtained a globulin, precipitable by saturating its solution with sodium chloride and when dissolved in ten per cent. sodium chloride brine coagulating on heating to 59° or 60°. From his results he concludes that the potato contains a globulin resembling myosin.

On investigating the juice of the potato Zöller obtained results which led him to conclude that the proteids therein dissolved are also globulins, but that further study was needed to explain their "peculiar deportment," especially, it is to be inferred, the fact of coagulation occurring at from 43° to 48°, and again, at 62°.

Vines states that prolonged treatment of the "crystalloids" of the potato with ten per cent. sodium chloride solution produces an apparent effect, but that they dissolve readily in a saturated solution of this salt, thus differing from all other protein crystals which he had observed.

Having had occasion to prepare a quantity of pure starch from the potato, we took advantage of the opportunity to examine the associated proteids.

After removing the skins, the tubers were crushed and squeezed in a drug press. The juice was strained through cloth and allowed to stand and deposit the greater part of the suspended matters. It was then saturated with ammonium sulphate and the precipitate so produced was filtered out. The potato pulp was washed with water and the washings after clearing were also saturated with ammonium sulphate. The two precipitates thus obtained were united, dissolved in salt solution, filtered clear and dialyzed.

The washed pulp was then treated with ten per cent. sodium chloride solution; the proteid, thus extracted, was precipitated with ammonium sulphate, dissolved in salt solution, filtered clear and also dialyzed. The globulin precipitated very slowly on dialysis, and after fourteen days was filtered out. The proteid obtained from the juice was much greater in amount than that from the salt extract of the pulp. The globulin, from both juice and salt extract, was then dissolved in salt solution, the solutions were united, filtered from a considerable quantity of insoluble globulin (rendered insoluble by long contact with water,) and the solution again dialyzed. After freeing from chlorides, the contents of the dialyzer were filtered, the reprecipitated globulin was washed with water and alcohol and dried over sulphuric acid, giving preparation **1**, weighing 7.34 grams.

The filtrate, from preparation **1**, still contained proteid and was therefore saturated with sodium chloride, which completely precipitated the remaining globulin. This was then dissolved in dilute salt solution and dialyzed in water until free from chlorides and, as the proteid was not thus precipitated, the dialyzer was transferred to alcohol, which soon threw down all the proteid. This was filtered out, washed in water and absolute alcohol and dried, giving 0.5 of a gram of preparation **2**.

The solutions, filtered from the globulin precipitated by the dialysis first described, were united and, in order to obtain the proteid in a solution of smaller volume, the liquid was saturated with ammonium sulphate, the precipitate produced was dissolved in a little water and the clear solution dialyzed, first in river water and then in distilled water. The globulin so precipitated was filtered out, washed with water and absolute alcohol and dried, yielding preparation **3**, weighing 3.40 grams. The filtrate from this preparation was dialyzed into alcohol and the resulting precipitate filtered out, washed with absolute alcohol and dried, forming preparation **4**, which weighed 1.74 grams.

The filtrate from **4** was further dialyzed in alcohol and the proteid completely precipitated by adding absolute alcohol. This substance after filtering out, washing with absolute alcohol and drying, weighed 0.53 of a gram and formed preparation **5.**

These several preparations were analyzed, after drying them at 110°, with the following results :

POTATO GLOBULIN. TUBERIN.

	Osborn and Campbell					Ritthausen.	
	1	**2**	**3**	**4**	**5**	I	II
Carbon	53.62	----	53.58	53.64	----	----	53.87
Hydrogen	6.80	----	6.91	6.83	----	----	7.30
Nitrogen	16.15	16.29	16.36	16.34	16.07	15.76	15.98
Sulphur	1.22	----	1.27	23.19	----	----	0.86
Oxygen	22.21	----	21.88				21.99
	100.00		100.00	100.00			100.00

The close agreement in composition among our five fractions is in itself, strong evidence that, besides this globulin, but little proteid is present in the potato. These five fractions practically include the whole of the proteid matter dissolved in the juice and salt extracts. The above figures given by Ritthausen for the composition of the proteid, obtained by coagulation of the juice at 65° and 76°, are also in close agreement with ours, excepting those for sulphur. The slightly lower nitrogen content of the coagulated globulin is to be expected, since proteids generally, if not always, yield some ammonia when coagulated by heat.

The potato globulin, when heated slowly in a double water bath, shows a wide range of variation in its coagulation point depending on the conditions under which it is dissolved.

A solution of this globulin prepared by treating a portion of preparation **1** with 10 per cent. sodium chloride solution and filtering out the insoluble matter, became turbid at 56° and a flocculent coagulum separated at 64°. After heating some time at 70° the coagulum was filtered out and the filtrate, when again tested, gave a turbidity at 72° and a flocculent coagulum at 76°.

Another preparation of this globulin was extracted, in the same way, with 10 per cent. salt solution, and the dissolved proteid was filtered from the insoluble matter and precipitated by saturating the solution with sodium chloride. The precipitated globulin was washed with saturated salt solution and removed from the paper mixed with a considerable quantity of the concentrated brine. Distilled water was gradually added until all of the proteid dissolved. The resulting solution was therefore almost completely saturated with the proteid. This solution when slowly heated in the double water bath to 44° C. and held at this temperature some minutes, became turbid and after a time flocculent, although the temperature remained perfectly constant. After raising the temperature to 50° it was filtered from the small coagulum which had formed and again heated, turbidity occurring at 50¼° and flocks separating at 51°. After heating some time at 56° the solution was filtered from the second small coagulum and again tested. Turbidity occurred at 58° and flocks separated at 59°, gradually increasing to a large coagulum at 66° which was filtered out. The filtrate now became turbid at 63°, flocks forming at 66°, and increasing to a considerable coagulum at 70°. The temperature was raised to 80° and the coagulum, which was about the same in amount as that formed at 66°, was filtered out. The filtrate gave only a trace of coagulum on boiling. The two coagula first formed were very small compared with the last two.

This test was then repeated with the same solution diluted with an equal volume of water. This solution was heated for some time at 44°, but remained perfectly clear. The temperature was then very slowly increased and at 53° a turbidity formed which, however, was scarcely greater at 56°. Above this temperature the turbidity increased until flocks separated at 62°, and a large coagulum formed at 65°. The solution filtered at 66°, gave a turbidity at 66°, with flocks at 68°, which formed a large coagulum on gradually raising the temperature to 80°, the filtrate from which gave no more coagulum on boiling.

The test was again repeated by mixing four parts of the same solution with one of water, and the same results obtained as with the solution diluted with an equal volume of water. This shows that within wide limits the temperature of coagulation does not depend on the relative quantity of dissolved proteid, but that the very low coagulation point of the undiluted solution was probably due to the presence of nearly enough sodium chloride to cause precipitation of the globulin. It will be noticed that coagulation of the proteid, which began at 56°, was not completed until the temperature had reached about 80°. This does not necessarily show the presence of several proteids, for such gradual coagulation is characteristic of most plant globulins, many being only very slowly coagulated, even by long boiling (Chittenden & Mendel, Jour. Phys. XVII, p. 52). The coagulum separated by heating solutions of this globulin to 75° C. is very soluble, on gently warming, in extremely dilute hydrochloric acid, even acid of $\frac{1}{100}$ per cent. dissolving the substance readily at 40°–50° C. The coagulum dissolves quickly and completely in $\frac{1}{10}$ per cent. caustic potash solution at 20° and in one per cent. sodium carbonate solution at 70° C. These solutions are precipitated by neutralization, but the substance thrown down is not soluble in salt solutions. The low heat-coagulation point obtained for the solution of the globulin precipitated with salt and dissolved in a minimum quantity of water is in accord with that given by Zöller for the proteid similarly obtained by him from the juice of the potato, and our observations explain to some extent the questions which he considered to require further investigation.

In order to determine more definitely whether other proteids were present with the globulin, a larger quantity of filtered potato juice, obtained from potatoes which had been washed carefully, but from which the skins had not been removed, was saturated with ammonium sulphate, the precipitate was dissolved in dilute salt solution, which was then filtered and saturated with sodium chloride. The globulin thus precipitated was filtered out, the filtrate was dialyzed for twenty-four hours in order to remove a considerable part of the salt, and was then saturated with ammonium sulphate. The small quantity of proteid thus precipitated was filtered out, dissolved in a little dilute salt solution and sodium chloride added to complete saturation. A considerable part of the dissolved proteid was thereby precipitated, which was filtered out and dissolved in dilute salt solution. The resulting liquid became turbid on heating to 58° C. and flocculent at 60°. The substance was evidently a part of the globulin which had escaped precipitation on the first saturation with salt, probably owing to the presence of some constituent of the juice.

The solution filtered from the salt saturation precipitate *last* described, was diluted with two volumes of water and then saturated with ammonium sulphate. The proteid thus separated was filtered out, dissolved in water and found to yield a turbidity at 52° and a flocculent coagulum at 58°, a coagulation point not essentially differing from that of the globulin.

The whole solution was then heated for some time at 70° C. in a water bath, the coagulum which separated was filtered out, and the filtrate, after removing a small quantity of coagulum, which separated on heating to 75°, was boiled and found to remain clear. This solution was then saturated with ammonium sulphate and the very small precipitate produced was filtered out, dissolved in a small amount of water and tested with the following results: nitric acid added to the solution in the cold gave no precipitate; saturation with sodium chloride gave no precipitate even when acetic acid was added. The biuret test was without result owing to the strong brown color of the solution. This substance therefore failed to give the most characteristic reactions of the proteoses, yet it must be considered as a proteose since in its essential properties it agrees more closely with this class of proteids than with any other.

The experiments made by Zöller on the juice of the potato were repeated by us with the same results as described by him, except that we found the solution of the precipitate produced by saturation with salt, to yield a flocculent coagulum at 52°, while Zöller's solution coagulated at 46°–48°. It has already been shown that a solution of the globulin similarly prepared gave a coagulum at 44°, and on dilution with one volume, as well as with one-fourth volume of water, the same solution coagulated at 62°. It is thus evident that the temperature of coagulation is not to be depended upon as a means of identifying this proteid with certainty. The other reactions described by Zöller are those given by the potato globulin. From these results then it would appear that by saturating the juice of the potato with sodium chloride the greater part of the globulin is precipitated, but that a not inconsiderable part remains in solution. If this is separated by saturation with ammonium sulphate and the precipitate so produced is dissolved in water, a large part of this globulin can be precipitated by again saturating with salt. The proteid still remaining in solution is nearly all coagulable and the solution on heating behaves exactly like a solution of the globulin.

CONCLUSION.

The proteids of the potato tuber consist of a globulin, for which we propose the name *Tuberin*, and a proteose, the latter occurring in very small amount. The properties of tuberin were found to be as follows:

It is precipitated by saturating its solutions with sodium chloride, sodium sulphate, magnesium sulphate, or ammonium sulphate. By acetic acid or nitric acid a precipitate is given readily soluble in an excess of acid even in the presence of salts.

Potassium ferrocyanide gives no precipitate until acetic acid is added. Mercuric chloride gives no precipitate, but picric acid or tannic acid throw down the globulin. With the biuret, Millon's, and the xanthoproteic tests the usual reactions are given.

Tuberin is soluble in very dilute saline solutions and therefore the juice of the potato contains the greater part of this proteid. By dialysis it is precipitated slowly and incompletely because of the difficulty of removing *all* soluble salts by this process. Like other easily soluble globulins it readily changes to the insoluble modification, so that preparations made by dialysis are to a great extent insoluble in saline solutions. In contact with alcohol it very quickly loses its solubility.

When dissolved in ten per cent. sodium chloride solution tuberin shows a somewhat variable heat-coagulation point depending on the conditions under which it is tested. In general a flocculent coagulum is formed on heating to 60°–65° C. Coagulation is, however, not complete until the solutions have been heated for some time at 80° C. The composition of this globulin was found from an average of several accordant analyses to be :

Tuberin.

Carbon	53.61
Hydrogen	6.85
Nitrogen	16-24
Sulphur	1.25
Oxygen	22.05
	100.00

LEGUMIN AND OTHER PROTEIDS OF THE PEA AND THE VETCH.

By Thomas B. Osborne and George F. Campbell.

Legumin.

Under the name Legumin, many preparations, obtained from various seeds, have been described, but in such different and often conflicting terms as to leave us completely in doubt with regard to the nature of this substance.

This confusion appears to have arisen largely through the mistaken idea, which formerly was very generally held, that all the proteids extracted from seeds by water and precipitated by acids are one and the same substance.

The methods of analysis employed by the earlier chemists were too crude or uncertain to set forth the slight differences in composition of the various plant proteids, and the difficulty of making pure preparations tended, as the subject was further studied, to add to the confusion. Since the methods of analysis have been perfected and the more recently developed modes of studying proteids introduced, legumin has received little or no attention. In recent literature legumin is most commonly referred to as a substance extracted from seeds by caustic alkalies, and more or less altered by the action of the solvent, but nothing has been done, to our knowledge, to show the nature of the original proteid.

The object of our investigation has been to examine the seeds in which legumin is said to exist and to determine as definitely as possible the composition and character of this substance.

In 1806 Einhof (Gehlens Jour. d. Chem. 6, 543) recognized a proteid in beans and lentils which he considered to be different from the bodies of this class previously known.

Braconnot (Ann. de Chim. et de Phys., 34, (2), 68, 1827) named this substance legumin.

Noad (Chem. Gaz., 1847, p. 357) prepared and analyzed legumin from peas and beans.

Norton (Amer. Jour. Sc. (2), 5, 22, 1847) prepared legumin from peas, sweet almonds and oats, and gave analyses of his preparations.

Loewenberg (Pogg. Ann., 78, 327) considered that legumin, as previously prepared, contained albumin and devised a method for the separation of these two proteids and gave analyses of the substances so prepared from almonds and peas.

Liebig (Ann. d. Chem. u. Pharm., 39, 138) obtained plant casein (legumin) from beans, lentils and peas and gave an account of the properties of this proteid and two analyses. He concluded that the substance was identical in properties and composition with milk casein.

Dumas and Cahours (Jour. f. Prakt. Chem., 28, 398) prepared legumin from peas, lentils, beans, almonds, plums, filberts and white mustard. They considered all these seeds to contain the same proteid substance; that obtained from the three first named seeds being less pure than that from the others and therefore, containing somewhat less nitrogen.

They gave analyses of preparations from all these seeds and an extended account of the properties of legumin, based on a study of the preparation obtained from the almond.

Contrary to Liebig, they concluded that this substance is not identical either with milk casein or plant casein. The latter designation they applied to the body which separates out on cooling a concentrated hot alcoholic extract of wheat gluten.

Rochleder (Ann. d. Chem. u. Pharm., 46, 155) pointed out that the substance obtained from beans, lentils and peas by Liebig was different from that of the almond described by Dumas and Cahours, and that for this reason these investigators did not reach the same conclusions. Rochleder prepared and analyzed legumin from two varieties of beans.

In 1868 Ritthausen undertook a study of legumin, the results of which are recorded in a series of papers whose publication extended over a period of fifteen years.*

He recognized that the seeds of almonds, plums, filberts and white mustard, which had been previously stated to yield legumin, really contain a different proteid, which he called

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* Jour. f. Prakt. Chem., 103, 65, 1868.
Die Eiweisskörper, etc., Bonn., 1872.
Pflügers, Archiv, 15, 269, 1877.
Ibid., 16, 293, 1878.
Ibid., 18, 236, 1878.
Jour. f. Prakt. Chem. (2), 24, 221, 1881.
Ibid., (2), 26, 504, 1882.

conglutin. Up to this time legumin was considered to be the proteid that is extracted from seeds with simple water and is precipitated by acids from the aqueous extract.

All proteids thus obtained had been regarded as identical by most investigators and were known either as legumin or plant casein. Although it had been suggested that different seeds yield different proteids, Ritthausen appears to have been the first to make this fact evident. Ritthausen prepared "legumin" from blue lupins, yellow, green and gray field peas, yellow garden peas, lentils, vetches, horse beans (Vicia faba), white and yellow beans (Phaseolus) and colza cake. The proteid of Phaseolus, Ritthausen afterwards found to be distinct from legumin, and one of us has, in the main, confirmed his later result and has named the proteid phaseolin.* Ritthausen afterwards considered the proteid which he obtained from colza cake to be an impure preparation of a different substance. His early analyses† of preparations from the leguminous seeds were fairly accordant, but he afterwards found that the soda lime method which was used in determining nitrogen gave too low results. He thereupon determined nitrogen anew by Dumas' method, and published a revised statement of the mean composition of legumin.‡

In another paper published shortly afterwards, Ritthausen withdrew the corrected figures for nitrogen, having found that they were too high, because the nitrogen of his later analyses was mixed with hydrogen. He therefore published a third set of figures for nitrogen and made a second revised statement of the mean composition of legumin.§

At this time Hoppe-Seyler (Physiol. Chemie, p. 75) and Th. Weyl (Zeitschrift f. Physiologische Chemie, 1, 72) stated that the proteids of plants are chiefly globulins and Weyl examined qualitatively a number of seeds, by extracting them with ten per cent. sodium chloride solution, and found proteids resembling in their reactions animal myosin and vitellin. They asserted that the substance called legumin by Ritthausen was doubtless originally a globulin and that the preparations of this substance described and analyzed by him were altered by the alkali which he used in extracting them and were not the proteids originally contained in the seeds. Ritthausen contended strongly against this view and maintained that his preparations were wholly unaltered by the alkali. He extracted several kinds of seeds with salt solution, precipitated the proteid by dilution with water and found that the preparations of legumin so made were not essentially different in composition from those obtained by extracting with dilute potash water.* He then examined his older preparations, made by extracting the seeds with weak alkali and showed that they were to a very considerable extent soluble in salt solution. The substance thus extracted had, in many cases, a different composition from that of the original preparation, and Ritthausen then concluded that all the preparations which he had previously described as legumin were, in fact, mixtures of the two proteids, one, soluble in salt solution after dissolving in potash water and precipitating with acid, similar to, but distinct from conglutin, and the other, originally soluble in salt solution but rendered insoluble in that fluid by treatment with alkalies. This latter he called legumin.

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* Report of the Conn. Agricultural Experiment Station, 1893, p. 186, and Journal of the American Chemical Society, vol. 16, p. 633.

† Die Eiweisskörper, &c., Bonn, 1872, pp. 159, 176.

‡ Pflüger, Archiv, XVI, 293, 1877.

§ Pflüger, Archiv, XVIII, 236, 1878.

He then purified the legumin by extracting the mixed proteids from the seed with dilute alkali, neutralizing with acid, extracting the precipitate so produced with sodium chloride solution to remove proteids soluble in that fluid and then redissolving the residue, consisting mostly of legumin, in dilute alkali and reprecipitating with acetic acid.

Two preparations were so obtained, one from the pea and another from the horse bean (*Vicia faba*).

Ritthausen regarded his study of these preparations as showing that the substance from *Vicia faba* was a compound of tannic acid with the salt soluble proteid and that it was doubtful whether the horse bean contains legumin at all.

The preparation from the pea he finally considered to be legumin, having the following composition:

LEGUMIN OF PEA, RITTHAUSEN.

Carbon	51.34
Hydrogen	6.98
Nitrogen	17.48
Sulphur	0.45
Oxygen	23.75
	100.00

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* Jour. f. Prakt. Chemie, 26, 504.

This analysis represents the composition of legumin not in its original condition, but so altered as to be insoluble in saline solutions. Of the reactions of legumin we know little more than that it dissolves in salt solution and is precipitated by diluting with water.

In the following pages we give the outcome of our recent investigation into the composition and properties of legumin as contained in the seeds of the pea and the vetch.

Here as in former papers we have described our procedure with considerable, perhaps unnecessary, detail, but having often experienced great difficulty in understanding and repeating the work of our predecessors because of the vagueness of their statements, we have endeavored to describe our methods and results so fully and accurately that any who may wish to review our investigations experimentally may find it practicable to do so.

I. PROTEIDS OF THE PEA.

One hundred grams of garden peas ground to pass a sieve of 1^{mm} mesh were extracted with petroleum naptha to remove oil, then dried by exposure to the air, and finally treated with one liter of ten per cent. sodium chloride solution. As the very viscid extract could scarcely be filtered through paper, an equal volume of ten per cent. sodium chloride solution was added, and after some time one half the solution passed the filter clear. This was saturated with ammonium sulphate, the resulting precipitate was filtered out, dissolved in salt solution and the liquid dialyzed free from chlorides. The proteid separated, as do all vegetable globulins thus far observed, in spheroids. No distinct crystals could be detected in this or any of our preparations from the pea. When the chloride had been removed by dialysis the precipitate was filtered out, washed with water and alcohol, dried over sulphuric acid and found to weigh 3.5 grams, being about 7 per cent. of the meal. Dried at 110° this preparation was analyzed with the following results:

PEA LEGUMIN, 1.

Carbon	52.03
Hydrogen	6.96
Nitrogen	17.98
Sulphur Oxygen	23.03
	100,00
Ash	0.41

Another preparation was made by extracting 500 grams of pea meal with three liters of ten per cent. sodium chloride brine and after allowing the mixture, protected with thymol, to stand three days in a cool place, 1500^{cc} of the extract were decanted. Although very turbid, this was saturated with ammonium sulphate without filtering, and the precipitate produced was filtered out and dissolved in brine. The resulting solution was then filtered without much trouble and the clear filtrate dialyzed free from chlorides. After washing and drying, the globulin thus precipitated, and amounting to ten grams or about 5 per cent. of the meal, had the following composition:

PEA LEGUMIN, 2.

	I.	II.	Average.
Carbon	52.08	52.19	52.14
Hydrogen	7.06	6.95	7.01
Nitrogen	18.01	17.91	17.96
Sulphur	0.49	----	0.49
Oxygen	----	----	22.40
			100.00
Ash	0.33		

In order to obtain larger quantities of this proteid for fractional precipitations 800 grams of pea meal were treated with four liters of *twenty* per cent. sodium chloride solution, and by draining on filters over night about one half the solution applied to the meal, or two liters, was obtained as a clear yellow filtrate, which was saturated with ammonium sulphate, but for a reason, then unknown, very little proteid separated. Dilute acetic acid saturated with ammonium sulphate was then added in small amount and the proteid separated as a flocculent precipitate. This was filtered out and in order to remove the acid as completely as possible the precipitate was suspended in about four liters of saturated ammonium sulphate solution and again filtered out. The precipitate was then dissolved in ten per cent. sodium chloride solution and calcium carbonate added to neutralize the acid retained by the proteid. The solution then reacted alkaline with litmus owing to ammonium carbonate set free from the sulphate. The solution was next filtered very nearly clear and dialyzed until a large precipitate had formed. This precipitate was filtered out, dissolved in salt solution, filtered clear and dialyzed free from chlorides. The precipitated globulin was washed with water and alcohol and dried over sulphuric acid, giving fifty-two grams, in whose analysis, after drying at 110°, the following figures were obtained:

PEA LEGUMIN, 3.

	I.	II.	Average.
Carbon	52.30	52.27	52.29
Hydrogen	7.06	6.98	7.02
Nitrogen	17.72	17.79	17.76
Sulphur	0.30	----	0.30
Oxygen	----	----	22.63
			100.00
Ash	0.53		

The solution filtered from this substance after its first precipitation by dialysis was saturated with ammonium sulphate, the resulting precipitate filtered out and dissolved in a little water, filtered clear and dialyzed. After removing the greater part of the salts by dialysis the precipitated globulin was filtered out, treated in the usual manner, and gave 14.2 grams of preparation **4**, having, when dried at 110° the following composition :

PEA PROTEID, 4.

	I.	II.	Average.
Carbon	52.50	----	52.50
Hydrogen	6.74	----	6.74
Nitrogen	16.83	16.76	16.80
Sulphur	0.49	----	0.49
Oxygen	----	----	23.73
			100.00
Ash	0.33		

Preparation **3** when dissolved in ten per cent. salt solution was found to become turbid at 97° and after long heating in a boiling water bath slowly developed a coagulum. Preparation **4** contained a considerable quantity of proteid coagulating at a much lower temperature. It was accordingly dissolved, as far as possible, in a little ten per cent. salt solution and the insoluble matter filtered out. The clear filtrate was diluted with distilled water until the solution contained 0.66 per cent. of salt, when a not inconsiderable precipitate formed, which was filtered out and the filtrate saturated with ammonium sulplate. This produced a relatively abundant precipitate, which was filtered out and dissolved in water. This solution on heating became turbid at 52°, and on keeping for some time at this temperature a minute quantity of flocks separated. Filtered at 56°, turbidity occurred again at 62° and a few flocks formed at 66°. Filtered at 67°, the solution became turbid at 70°, the turbidity increasing above 75° to a heavy flocculent coagulum at 79°.

It is evident from these results that we have in preparation **4** at least two proteids, one coagulating at 79°, the other being only slowly and imperfectly coagulated at 99°–100°; the former is readily soluble in very dilute salt solutions, the latter only slightly soluble in solutions containing less than one per cent. of salt. The filtrate from preparation **4** was dialyzed in water, but as no more globulin separated, the dialyzer was transferred to alcohol and the proteid thus completely thrown down. After washing with absolute alcohol and drying over sulphuric acid 12.31 grams of substance were obtained. This, of course, was a mixture of all the proteids extracted from the pea which had not been precipitated by dialysis in water. It was therefore treated with two per cent. salt solution, a large quantity of proteid which had been coagulated by the alcohol was filtered out, washed with water, with dilute and absolute alcohol, and dried over sulphuric acid. This preparation, **5**, weighed 7.45 grams and gave the following results when analyzed, after drying at 110°.

PEA PROTEID, **5**.

	I.	II.	Average.
Carbon	53.40	53.26	53.33
Hydrogen	6.92	7.03	6.98
Nitrogen	16.19	16.09	16.14
Sulphur	1.00	----	1.00
Oxygen	----	----	22.55
			100.00
Ash			0.32

The filtrate from **5** was saturated with ammonium sulphate, whereupon a small gummy precipitate appeared which was filtered out and dissolved in a small quantity of water. This solution when heated became turbid at 49° and flocculent at 60°; filtered at 75°, turbidity occurred on heating again to 72° and flocks formed at 79°. After heating to about 90° no more proteid was coagulated by boiling. The solution now contained a very small quantity of proteose.

Since acetic acid was used to separate the substance, from which 3, 4 and 5 were obtained, from the ammonium sulphate solution, it was necessary to obtain more of the proteids without the use of acid. It was found that the incomplete precipitation by ammonium sulphate was due to the use of twenty per cent. sodium chloride solution, in which less ammonium sulphate dissolves than in a ten per cent. salt solution, not enough, in fact, to completely precipitate the proteid. The meal residue was therefore treated with water enough to reduce the strength of the salt solution still adhering to it to about ten per cent. A further considerable quantity of nearly clear extract was thus obtained, which, when saturated with ammonium sulphate, readily and completely parted with the proteid. This was filtered out, dissolved in ten per cent. brine, the solution filtered perfectly clear and dialyzed. After a large quantity of globulin had separated in the dialyzer its contents were filtered off, the precipitate was dissolved in ten per cent. salt solution and treated in exactly the same way as **3** had been. This preparation, **5**, weighed 37.5 grams and, dried at 110°, had the following composition:

PEA LEGUMIN, **6.**

	I.	II.	Average.
Carbon	52.37	----	52.37
Hydrogen	6.90	----	6.90
Nitrogen	17.95	17.95	17.95
Sulphur	0.39	----	0.39
Oxygen	----	----	22.39
			100.00
Ash	0.28		

The filtrate from the first precipitation, by dialysis, of this substance, when saturated with ammonium sulphate gave a precipitate which was dissolved in a little water and the resulting solution was filtered clear and dialyzed. After most of the salts were thus removed the separated globulin was filtered out, washed and dried, and gave 2.44 grams of preparation **7**, having the following composition, when dried at 110° :

PEA PROTEID, **7.**

	I.	II.	Average.
Carbon	52.09	52.02	52.06
Hydrogen	6.96	7.08	7.02
Nitrogen	16.75	16.57	16.66
Sulphur	0.55	----	0.55
Oxygen	----	----	23.71
			100.00
Ash	0.20		

This analysis is in fair accord with that of the similarly obtained preparation **4.**

The filtrate from 7 was dialyzed into alcohol and then absolute alcohol was added to the solution until all the proteids separated. The precipitate thus produced was filtered out, washed with absolute alcohol, dried over sulphuric acid and found to weigh 7.1 grams. Since this preparation might be a mixture of any unprecipitated globulin, with albumin and proteose, if these were present, it was treated with water and the considerable quantity of proteid coagulated by alcohol was filtered out, washed thoroughly with water and then with absolute alcohol and dried over sulphuric acid. This gave 4.05 grams of preparation **8**, which, when dried at 110°, had the following composition :

PEA PROTEID, **8**.

	I.	II.	Average.
Carbon	53.60	53.47	53.54
Hydrogen	6.99	6.98	6.99
Nitrogen	16.72	16.65	16.69
Sulphur	1.01	----	1.01
Oxygen	----	----	21.77
			100.00
Ash	0.32		

The analysis of **8** agrees well with that of **5** and it is probable that these figures pretty nearly represent the composition of a second proteid (globulin or albumin) readily soluble in very dilute salt solutions.

Having thus found evidence of the presence of at least two proteids in the pea extract, one less soluble than the other in very dilute salt solutions, it became necessary to subject the less soluble and more abundant globulin to thorough fractioning in order to learn whether it was homogeneous or a mixture.

Twenty-five grams of **3** were therefore dissolved in 250^{cc} of five per cent. sodium chloride solution, filtered clear and the filter washed with 50^{cc} of the same salt solution. A portion of the preparation had, as is usually the case with vegetable globulins when dried, passed into an insoluble form. This insoluble matter when treated with salt solution gave a gummy residue, which was difficult to filter out. No estimate of the amount of this substance could be made.

The clear salt solution of the globulin was diluted with twice its volume of water, making 750^{cc} of a 1.67 per cent. solution, of sodium chloride. After standing over night the proteid which had precipitated on dilution was collected on a filter, washed with water and alcohol and dried over sulphuric acid. Preparation **9** was so obtained, weighing 5.1 grams and having, when dried at 110°, the composition given below.

The solution filtered from this substance was treated with an equal volume of water making 1500^{cc} of a brine containing 0.84 per cent. of salt, from which after standing some time a part of the proteid separated as a viscid layer at the bottom of the beaker. The solution was decanted and the precipitate washed and dried in the usual manner. This, **10**, weighed 5.29 grams. The decanted liquid was then dialyzed free from salt and the precipitated globulin treated in the usual manner, giving **11**, weighing 4.10 grams. About three-fifths of the original substance was thus recovered in three nearly equal fractions. The other two-fifths consisted largely of insoluble globulin. The composition of the fractions so obtained was as follows:

PEA LEGUMIN, FRACTIONS OF **3**.

	9.			**10.**			**11.**		
	I.	II.	Average.	I.	II.	Average.	I.	II.	Average.
Carbon	52.49	52.23	52.36	52.31	52.09	52.20	52.25	52.25	52.25
Hydrogen	7.11	7.10	7.11	7.09	6.92	7.01	7.08	----	7.08
Nitrogen	17.96	18.05	18.01	17.98	17.96	17.97	17.88	17.84	17.86
Sulphur	0.35	----	0.35	0.35	----	0.35	----	----	22.81
Oxygen	----	----	22.17	22.27	----	22.47	----	----	
			100.00	100.00		100.00			100.00
Ash	0.22			0.61			0.20		

Again, twenty-five grams of preparation **5** were dissolved in 250^{cc} of five per cent. brine, the solution filtered, the residue washed with 50^{cc} of the same brine and the clear filtrate diluted with one and a half volumes of water, thus giving a two per cent. salt solution. After standing over night the precipitate was filtered out, washed with water and alcohol and dried over sulphuric acid. Preparation **12** so obtained weighed 8.58 grams.

The filtrate from **12**, on adding an equal volume of water and treating the precipitate as just described, yielded **13**, weighing 2.84 grams.

The filtrate from **13**, dialyzed free from salt, gave **14**, weighing 4.2 grams.

PEA LEGUMIN, FRACTIONS OF 5.

	12.			13.	14.		
	I.	II.	Average.		I.	II.	Average.
Carbon	52.26	----	52.26	52.08	52.01	52.02	52.02
Hydrogen	6.96	----	6.96	7.04	----	7.20	7.20
Nitrogen	17.96	18.06	18.01	17.88	17.81	18.03	17.92
Sulphur	0.44	----	0.44	23.00	----	----	23.86
Oxygen	----	----	22.33		----	----	
			100.00	100.00			100.00
Ash	0.40		0.19	0.17			

Comparing the analyses of these fractions with each other and with that of the original substance, it is plain that they all represent a single proteid.

SUMMARY OF ANALYSES OF PEA LEGUMIN.

	1.	2.	3.	6.	9.	10.	11.
C.	52.03	52.14	52.29	52.37	52.36	52.20	52.25
H.	6.96	7.01	7.02	6.90	7.11	7.01	7.08
N.	17.98	17.96	17.76	17.95	18.01	17.97	17.86
S.	23.03	0.49	0.30	0.39	0.35	0.35	22.81
O.		22.40	22.63	22.39	22.17	22.47	
	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	12.	13.	14.	Average.
C.	52.26	52.08	52.02	52.20
H.	6.96	7.04	7.20	7.03
N.	18.01	17.88	17.92	17.93
S.	0.44	23.00	22.86	22.45
O.	22.33			
	100.00	100.00	100.00	100.00

Ritthausen obtained from peas by extraction with salt solution and precipitation with water two preparations, the analyses of which are given below, A and B.*

By treating peas with very weak potash water, adding acid to neutralization, extracting the precipitate thus produced with salt solution and filtering out the insoluble matter, he obtained a solution from which, by adding water, a precipitate was thrown down whose composition is given below under C.

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* Jour. f. prakt. Chem., 26, 504.

PEA LEGUMIN.

	Ritthausen.			Osborne & Campbell. Average of 18 analyses on 10 preparations.
	A.	B.	C.	
Carbon	52.83	51.61	51.62	52.20
Hydrogen	7.27	7.08	6.96	7.03
Nitrogen	17.26	17.23	18.26	17.90
Sulphur } Oxygen	22.64	24.08	0.33	0.39
			22.83	22.48
	100.00	100.00	100.00	100.00

Ritthausen's preparation C agrees fairly well with the average of our results. The preparations extracted directly from peas by salt solution would appear to be the same substance but less pure. We see no ground for Ritthausen's idea that his older preparations were mixtures of two proteids both originally soluble in salt solution, one of which, legumin, is rendered insoluble in salt solution by treatment with alkalies. It is much more probable that a part of the globulin in his preparations had assumed the insoluble condition during the process of separating, since nearly all globulins, to a greater or less extent, are prone to this change. The difference in composition between Ritthausen's original "legumin" and the substance extracted from it by salt solution is doubtless due to the greater purity of the latter. This view is supported by the close agreement in composition of this substance with those extracted by us directly from the pea. For this, the chief proteid of the pea, it is proper to retain the name *Legumin* first proposed by Braconnot.

The properties of legumin are as follows:

In water it is entirely insoluble.

In ten per cent. sodium chloride solution, when freshly prepared and not dried, it is readily soluble, but after washing with alcohol and drying over sulphuric acid, more or less becomes insoluble in salt solution. Dissolved in ten per cent. sodium chloride solution legumin is not precipitated by saturating the solution with magnesium sulphate, or sodium chloride. Saturated with sodium sulphate at 20°, no precipitate is produced; saturated at 25°, a turbidity appears; but saturated with sodium sulphate at 34°, all but a trace is thrown out of solution. By saturation with ammonium sulphate at common temperatures it is completely precipitated.

Dissolved in salt solution, legumin is not precipitated by mercuric chloride but gives a heavy precipitate on adding either picric, tannic, hydrochloric, nitric, sulphuric or acetic acid.

In water containing a very small quantity of acid, legumin readily dissolves and is precipitated by adding sodium chloride. It is readily soluble in dilute alkalies and alkali carbonates.

Adding to its solution glacial acetic acid and concentrated sulphuric acid, a violet color is produced. With cupric sulphate and caustic potash, after standing, a crimson red color appears, almost as red as that given by peptones. With Millon's and the xanthroproteic tests the usual reactions are given. When dissolved in ten per cent. sodium chloride solution and gradually heated, the solution becomes turbid at 97° and on long heating in a boiling water bath, a coagulum gradually separates.

II. Proteids of the Vetch.

One hundred grams of finely ground meal of the seed of the common vetch (*Vicia sativa*) were treated with water and the extract after filtering clear was saturated with ammonium sulphate. The small precipitate thereby produced was filtered out and dissolved in water; the resulting solution was filtered clear and dialyzed until free from chlorides. The globulin thus precipitated, after washing with water and with alcohol, weighed 1.04 grams. The meal residue was then treated repeatedly with ten per cent. sodium chloride solution and after filtering clear the extract was saturated with ammonium sulphate, the precipitated proteid filtered out and dissolved in brine. The resulting solution was filtered clear and dialyzed until free from chlorides. The globulin thus precipitated, when washed with water and alcohol, and dried over sulphuric acid, weighed 5.0 grams. When dried at 110° this preparation, **15**, had the following composition:

Vetch Legumin. **15.**

Carbon	52.45
Hydrogen	6.98
Nitrogen	18.04
Sulphur	0.50
Oxygen	22.03
	100.00
Ash	0.27

The meal residue was next treated with two-tenths per cent. potash water, the extract filtered clear and neutralized with very dilute hydrochloric acid; the precipitate thus produced was dissolved in two-tenths per cent. potash water, the clear solution was neutralized with dilute hydrochloric acid and the precipitated proteid washed with water and alcohol and dried. This preparation **16** weighed 4.4 grams and gave the following results on analysis:

VETCH PROTEID, **16.**

	I.	II.	Average.
Carbon	52.41	52.43	52.42
Hydrogen	7.13	7.02	7.07
Nitrogen	16.55	----	16.55
Sulphur Oxygen	----	----	23.96
			100.00
Ash	0.74		

Four kilograms of vetch meal were next treated with twelve liters of ten per cent. sodium chloride brine and the residue washed with the same solution. The extract and washings were partly cleared by subsidence, then saturated with ammonium sulphate. The precipitate so produced was dissolved in brine, but the resulting solution was very difficult to filter. The greater part of the suspended impurities was removed by passing the extract through a loose bed of filter paper pulp and the proteid was again separated by saturation with ammonium sulphate. This precipitate was dissolved in brine and the solution, kept cold, then filtered perfectly clear. This solution was dialyzed in two portions, D and E. After nearly freeing from chlorides, a large precipitate formed in each dialyzer, which was filtered out. That obtained from E was washed with water and with alcohol as long as any coloring matter was extracted, and was then dried over sulphuric acid giving 120 grams of a slightly pink powder, which will be designated F. That from D was redissolved in ten per cent. sodium chloride brine, the solution filtered perfectly clear and dialyzed until free from chlorides. All but a trace of proteid was thus thrown down. The precipitate was washed thoroughly with water and with alcohol and dried over sulphuric acid yielding preparation **17**, which weighed 90 grams and was very slightly colored. After drying at 110°, this preparation had the following composition:

VETCH LEGUMIN, **17.**

	I.	II.	Average.
Carbon	51.98	51.97	51.98
Hydrogen	6.94	6.89	6.92
Nitrogen	17.96	18.00	17.98
Sulphur	0.45	----	0.45
Oxygen	----	----	22.67
			100.00
Ash	0.20		

The filtrates from the first dialysis of solutions D and E were separately saturated with ammonium sulphate, the precipitates obtained were dissolved in water and the solutions filtered and dialyzed. The precipitate from D, thrown down by dialysis, was redissolved in salt solution and again precipitated by dialysis. The two preparations of globulin thus obtained were washed with water and with alcohol and dried over sulphuric acid, that from D weighed 4.11 grams, forming preparation **18**, and that from E gave preparation **19**, weighing 7.67 grams. On analyzing these preparations, dried at 110°, the following results were obtained :

VETCH LEGUMIN.

	18.	**19.**
Carbon	52.21	52.18
Hydrogen	6.82	6.82
Nitrogen	17.99	17.99
Sulphur	0.37	0.36
Oxygen	22.61	22.65
	100.00	100.00

The filtrate from the first precipitation by dialysis of **18** was united with the filtrate from **19** and the heat coagulation point determined in a portion of the solution, in which ten per cent. of sodium chloride had been dissolved. This solution became turbid at 56° and flocks separated at 63° in considerable quantity. After heating to 70° for some time and filtering, turbidity occurred on heating to 71° and a flocculent coagulum formed at 73°, about the same in amount as at 63°. After heating to 78°, the solution was filtered and again heated, the turbidity forming a third time at 79° and flocks at 83° in smaller quantity than before. This slow and incomplete coagulation does not necessarily indicate the presence of several coagulable proteids in the solution, for there is no temperature-interval between the successive coagula, the temperature at which turbidity occurs and a flocculent coagulum develops being determined, after the first coagulum has formed, by the temperature at which the solution was filtered. Each time the solution becomes turbid at a temperature just above that to which it had been previously heated and a flocculent coagulum separates at three or four degrees higher.

The presence of salts has much influence on the coagulation point, for another portion of this same solution, to which no salt had been added, became turbid at ten degrees lower than the portion wherein ten per cent. of sodium chloride had been dissolved and gave the last flocculent coagulum at a temperature ten degrees higher.

The solution, portions of which had served for the foregoing observations, was then dialyzed into alcohol until concentrated to one half its original volume, when a considerable precipitate formed which was filtered out, washed with alcohol and dried over sulphuric acid. This substance consisted of a mixture of all the proteids remaining in solution after separating the globulin, as described. Any albumin or globulin which might be contained in this precipitate would probably be largely if not wholly coagulated by the long treatment with alcohol and the subsequent drying. This preparation was therefore very finely pulverized and extracted thoroughly with water. The insoluble residue was then washed with alcohol and dried, yielding 13.52 grams of preparation **20**, which was found to have the following composition:

VETCH PROTEID, **20**.

	I.	II.	Average.
Carbon	53.45	53.65	53.55
Hydrogen	6.67	6.73	6.70
Nitrogen	16.46	----	16.46
Sulphur	1.02	----	1.02
Oxygen	----	----	22.27
			100.00
Ash	0.29		

The solution filtered from **20** was further dialyzed into alcohol and a second precipitate obtained, which, when washed with alcohol and dried, weighed 5.64 grams and was composed as follows:

VETCH PROTEID, **21.**

	I.	II.	Average.
Carbon	52.55	52.66	52.60
Hydrogen	6.70	6.95	6.83
Nitrogen	16.53	16.76	16.69
Sulphur	1.23	----	1.23
Oxygen	----	----	22.65
			100.00
Ash	0.65		

The filtrate from the precipitate produced by the first dialysis into alcohol, from which preparations **20** and **21** had been obtained, was further dialyzed into alcohol yielding a second precipitate which, when washed with alcohol and dried over sulphuric acid, weighed 2.21 grams and formed preparation **22.** This consisted of proteose and, after drying at 110°, had the composition as follows:

VETCH PROTEOSE, **22.**

	I.	II.	Average.
Carbon	50 95	50.76	50.85
Hydrogen	6.78	6.72	6.75
Nitrogen	16.53	16.79	16.65
Sulphur Oxygen	----	----	25.75
			100.00
Ash	2.18		

Comparing the composition of **21** with that of **20,** it is seen that, excepting carbon, the figures agree quite well. **21,** however, contains one per cent. less carbon than **20,** which is easily explained by its being a mixture of the proteose represented by **22,** and the proteid represented by **20.** Such a mixture would be expected from the method of preparation.

If **20** is compared with **5** and **8,** obtained in a similar manner from the pea, by dialysis of its extracts into alcohol, after precipitation of the greater part of the globulin contained in these extracts by dialysis in running water, it will be observed that they rather closely agree. It is hardly possible by this method to obtain entirely pure preparations, but our results show that the vetch and pea both contain another proteid that is different from legumin in composition and in properties.

To facilitate comparison these analyses are here tabulated.

	PEA PROTEID.		VETCH PROTEID.
	5.	**8.**	**20.**
Carbon	53.33	53.54	53.55
Hydrogen	6.98	6.99	6.70
Nitrogen	16.14	16.69	16.46
Sulphur	1.00	1.01	1.02
Oxygen	22.55	21.77	22.27
	100.00	100.00	100.00

It will be noted that this proteid contains more carbon and less nitrogen than legumin and nearly twice as much sulphur.

Whether it is a globulin soluble in extremely dilute salt solutions or an albumin soluble in pure water, we have not as yet undertaken to ascertain, for want of time.

The residue of the meal extracted, as described, with salt solution, was treated with two-tenths per cent. potash solution, a portion of the alkali extract was filtered clear and neutralized with very dilute hydrochloric acid. The precipitate which resulted was dissolved in two-tenths per cent. potash water, and after filtering perfectly clear, again thrown down by neutralizing with hydrochloric acid. After drying, 12.4 grams of **23** were obtained, having the following composition:

VETCH PROTEID, **23**.

	I.	II.	Average.
Carbon	53.00	52.99	53.00
Hydrogen	6.91	7.02	6.97
Nitrogen	16.45	----	16.45
Sulphur	0.53	----	0.53
Oxygen	----	----	23.05
			100.00
Ash	0.92		

If this analysis is compared with that of **16**, it will be noted that, although they agree in nitrogen content, they differ as respects carbon. The sulphur found in **23** would indicate that **23** is a mixture of legumin with other substances. It seems to us probable that it is mainly legumin which escaped extraction by the salt solution through imperfect pulverization of the meal or its incomplete exhaustion by the brine, or because it was present in the salt-insoluble form, a form which it may have assumed in the seed itself, or under the action of the solvents to which the meal was subjected. It has been our experience with other seeds that extractions with alkali, after exhausting the seed with salt solution, yields products which, in most cases, it is impossible to purify.

In order next to determine whether the legumin found in the vetch seed is a single proteid or a mixture, the following fractional precipitations were made.

One kilogram of the meal was extracted with ten per cent. sodium chloride solution and, after filtering clear, the extract was saturated with ammonium sulphate and the proteids, thus precipitated, dissolved in 300 c.c. of ten per cent. brine. The solution now measured 400 c.c. and contained about eight per cent. of salt. After filtering perfectly clear, from a small amount of insoluble matter, an equal volume of distilled water was added. On standing a short time the proteid thus precipitated collected on the sides and bottom of the beaker as a sticky deposit, leaving the solution nearly clear. The latter was then decanted and the translucent, gummy mass of proteid washed with water, which caused it to turn opaque and become brittle, so that it was easily rubbed to a coarse powder.

After washing repeatedly with water the proteid was thoroughly washed with dilute alcohol, then with absolute alcohol, and dried over sulphuric acid. This preparation, **24**, weighed 13.4 grams.

The solution decanted from **24** was cooled in an ice box over night and the clear supernatant liquid poured from the perfectly transparent semifluid layer which had thus formed on the bottom of the beaker. After washing and drying, 12.9 grams of preparation **25** were obtained. The solution decanted from **25** was mixed with an equal volume of distilled water and left over night in the ice box. A transparent layer of proteid was again deposited, which, when washed and dried, yielded 4.00 grams of **26**.

The solution decanted from **26** was saturated with ammonium sulphate, the precipitated proteid dissolved in salt solution, and after filtering, the proteid was precipitated by dialysis. The globulin thus separated, after washing and drying, weighed 3.35 grams, and formed preparation **27**.

The following figures were obtained by analyzing these preparations when dried at 110°.

Vetch Legumin.

	24.	25.	26.	27.
Carbon	52.05	51.78	52.17	52.04
Hydrogen	6.99	6.89	6.92	7.06
Nitrogen	18.02	18.06	17.70	18.02
Sulphur	0.56	0.48	23.21	22.88
Oxygen	22.38	22.79		
	100.00	100.00	100.00	100.00

Several grams of preparation E, described on page 276, were dissolved in a very little two-tenths per cent. potash water, the solution was diluted considerably with distilled water and carbonic acid gas passed through it. At first the solution remained clear, but after a time the proteid suddenly and almost completely separated as a voluminous precipitate, the filtrate from which yielded but a trace of proteid on saturating with ammonium sulphate. The precipitate was washed with water and then treated with salt solution. A part dissolved and the rest was converted into a swollen gelatinous mass which rendered filtration impossible. After standing over night the solution was poured off and the gummy residue was washed by decantation, at first with salt solution and then with water. On washing out the salt, the residue lost its gummy character and became a dense, rapidly settling precipitate which was readily collected on a filter and completely washed with water and then with alcohol. After drying over sulphuric acid it furnished 2.62 grams of preparation **28.** This peculiar behavior of legumin which has lost its solubility in salt solution, we have observed in a number of cases.

E, when treated directly with salt solution, behaved in exactly the same manner as the precipitate obtained by passing carbonic acid through its solution in dilute potash water, that is, a part dissolved and a part remained as a gummy residue, which was dehydrated (?) by washing with water. The saline solution described above, which had been decanted from the part of the carbonic acid precipitate which was insoluble in salt solution, was filtered clear and dialyzed free from chlorides. The precipitate which resulted was filtered out, washed and dried in the usual manner, and yielded **29.** These two preparations were found to have the following composition :

VETCH LEGUMIN.

	28.	29.
Carbon	52.11	51.89
Hydrogen	6.82	6.88
Nitrogen	18.17	18.09
Sulphur	0.53	0.40
Oxygen	22.37	22.74
	100.00	100.00
Ash	0.27	0.13

Several grams of preparation **17** were dissolved in a little two-tenths per cent. potash water and the resulting clear solution was neutralized with dilute acetic acid, thereby precipitating the proteid. A portion of this precipitate was tested with ten per cent. sodium chloride solution and found to dissolve to a large extent and on warming to 50° nearly all went into solution. The remainder of the precipitate was washed, dried and analyzed with the following results :

VETCH LEGUMIN, **30.**

Carbon	52.06
Hydrogen	6.80
Nitrogen	17.98
Sulphur	0.53
Oxygen	22.63
	100.00
Ash	0.15

Another portion of preparation **17** was treated with two-tenths per cent. hydrochloric acid and yielded a clear solution, which was neutralized with one-half per cent. sodium carbonate solution. The resulting precipitate was partly soluble in ten per cent. salt solution. It was washed and dried and, as preparation **31,** gave the following figures when analyzed :

VETCH LEGUMIN, **31.**

Carbon	52.12
Hydrogen	6.68
Nitrogen	18.20
Sulphur	0.40
Oxygen	22.60
	100.00
Ash	0.15

For convenience of comparison the analyses of legumin from the vetch are brought together in the following tables:

SUMMARY OF ANALYSES OF VETCH LEGUMIN.

	15.	**16.**	**18.**	**19.**	**24.**	**25.**
Carbon	52.45	51.98	52.21	52.18	52.05	51.78
Hydrogen	6.98	6.92	6.82	6.82	6.99	6.89
Nitrogen	18.04	17.98	17.99	17.99	18.02	18.06
Sulphur	0.50	0.45	0.37	0.36	0.56	0.48
Oxygen	22.03	22.67	22.61	22.65	22.38	22.79
	100.00	100.00	100.00	100.00	100.00	100.00

	26.	**27.**	**28.**	**29.**	**30.**	**31.**
Carbon	52.17	52.04	52.11	51.89	52.06	52.12
Hydrogen	6.92	7.06	6.82	6.88	6.80	6.68
Nitrogen	17.70	18.02	18.17	18.09	17.98	18.20
Sulphur	23.21	22.88	0.53	0.40	0.53	0.40
Oxygen			22.37	22.74	22.63	22.60
	100.00	100.00	100.00	100.00	100.00	100.00

It will be seen from the following statement that the composition of legumin from the pea is identical with that from the vetch.

LEGUMIN.

	PEA	VETCH
	Average of 18 analyses on 10 preparations.	Average of 13 analyses on 12 preparations.
Carbon	52.20	52.09
Hydrogen	7.03	6.88
Nitrogen	17.93	18.02
Sulphur	0.39	0.46
Oxygen	22.45	22.55
	100.00	100.00

What we have already stated concerning the properties and reactions of pea legumin applies strictly to that from the vetch except in two particulars. The solutions of pea legumin in ten per cent. brine when heated nearly to boiling become turbid and, after a time, a considerable coagulum separates in the form of a semi-solid clot. Similar solutions of the vetch legumin, on the other hand, remain perfectly clear, even after prolonged boiling.

Many carefully conducted experiments made with the legumin from each of these seeds, wherein the same quantity of globulin was dissolved in the same amount of salt solution of the same strength, were carried out side by side, but always with the same results, the pea legumin coagulating to a greater or less extent while the vetch legumin remained wholly unaffected.

That this difference is due to some foreign substance is indicated by the following experiment. A quantity of ten per cent. sodium chloride extract of pea meal was filtered clear and divided into two parts, one of which was dialyzed directly, the other was saturated with sodium chloride and filtered clear. The latter solution was less viscid and much more easily filtered, presumably due to the removal of gum. This solution, saturated with salt, was then dialyzed.

The globulin precipitated by dialysis from each of the abovenamed solutions, was dissolved in brine to new solutions containing ten per cent. of globulin and eight per cent. of sodium chloride. When these two solutions were heated, side by side, in the same water bath and for the same length of time, a most marked difference was observed in the quantities of coagulum that appeared. Each solution contained a small quantity of the proteid coagulating at about 80°, so that after heating to 85° for some time, they were filtered clear and again heated.

Each solution then became turbid at 93° and, after heating the bath to boiling for a little time, the solution of the globulin from the salt saturated extract became curdy, from the separation of a moderate quantity of coagulum, while that from the unsaturated extract set to a firm opaque jelly, so that the tube could be inverted without displacement of its contents.

The second difference noted was very slight, but appeared to be constant. By precipitating the legumin from the pea by dialysis, the proteid was obtained in the forms of spheroids which showed little tendency to adhere in masses, while that from the vetch was always obtained in more or less coherent lumps which, however, were not at all fluid and gummy, but were easily broken up on stirring. In our opinion, the legumin from these two seeds is one and the same substance, or must, at least for the present, be so regarded.

SUMMARY.

1. So far as we have investigated, peas and vetches contain the same proteids, which are nearly if not entirely soluble in ten per cent. sodium chloride solution.

2. The greater part of these proteids consists of a globulin, the *Legumin* of Braconnot, which is readily precipitated by dialyzing its salt solutions.

The prevalent idea that legumin is soluble only in acids and alkalies is erronous, it having been proved, notably by Ritthausen, to be a true globulin. The composition of legumin, as shown by the average of our accordant analyses of thirty-one preparations obtained from the seeds of peas and vetches, is the following:

LEGUMIN.

Carbon	52.15
Hydrogen	6.96
Nitrogen	17.98
Sulphur	0.43
Oxygen	22.48
	100.00

Legumin is abundantly soluble in solutions containing above five per cent. of sodium chloride, in those containing less salt it is not so soluble, the amount held in solution decreasing as the salt content diminishes, so that it is but sparingly soluble in solutions containing less than one per cent. of salt. By dilution with water, strong saline solutions of legumin are abundantly precipitated.

By saturation with sodium chloride or magnesium sulphate, its sodium chloride solutions are not precipitated; by saturation with sodium sulphate at 25° they are not precipitated, but at higher temperatures more or less is thrown down, and by saturation with sodium sulphate at 34°, precipitation is very nearly complete. With nitric acid, Millon's and Adamkiewic's reagents it gives the usual proteid reactions.

With strong solutions of legumin the biuret test gives a violet color at first, which on standing becomes crimson red, similar to the color produced by peptones.

The legumin obtained by us from the vetch is not coagulated by heat nor even rendered turbid by prolonged boiling of strong solutions.

The legumin prepared by us from the pea is partly coagulated by heating strong solutions in a boiling water bath, and sets to a firm jelly after thus heating for some time. These differences in their behavior on heating, and a greater tendency of the vetch legumin to cohere in semi-solid lumps when precipitated by dialysis, are the only points of dissimilarity which a rigid comparison of preparations from the two seeds has revealed.

These differences, in our opinion, are due to the substances with which the proteid is associated in the two seeds, for saturation of the pea extracts with sodium chloride, before precipitating the legumin by dialysis, greatly diminished the amount of coagulum given by the pea legumin.

3. Besides the legumin, the pea and vetch contain another proteid in small amount, either an albumin or a globulin, soluble in extremely dilute salt solutions, and coagulated by heating its solutions to 80°. This substance we have not studied further than to make two preparations for analysis from the pea and one from the vetch. These were obtained in an insoluble form by coagulating with alcohol, so that the properties and reactions were not determined. The composition of this proteid is shown by the following average of three closely agreeing analyses:

PROTEID OF PEA AND VETCH.

Carbon	53.48
Hydrogen	6.89
Nitrogen	16.43
Sulphur	1.01
Oxygen	22.19
	100.00

4. In addition to the foregoing proteids a very little *proteose* was found in the extracts of both these seeds.

5. No attempt has yet been made to determine the total quantity of proteids in these seeds, nor to study minutely the proteids that occur in them in small proportion.

CONGLUTIN AND VITELLIN.

By Thomas B. Osborne and George F. Campbell.

Review of the literature relating to the plant proteids hitherto described as Conglutin and Vitellin, shows that the subject is in great confusion, which can only be cleared up by a thorough examination of the seeds from which these proteids are said to have been obtained. This is the more important, because of late years various investigations have been made in which these proteids have figured as the subject of study, while the fact, that the purity or even the identity of the proteid employed is very doubtful, has been entirely overlooked or ignored. Thus the results of observations on the globulin of lupins have been applied to the globulin of the squash, hemp and other seeds, it being apparently unknown that these two proteids are very distinct substances. Further, the composition and reactions of most of these bodies have never been adequately studied, nor the means of preparing them in a state of purity ascertained. Recent authors are mostly content to call these proteids vegetable vitellin and to assume, with little reason, that the proteid from the many seeds in which vitellin has been said to occur is one and the same substance. With the object of determining, so far as may be practicable, the true relations of the globulins found in the various seeds hitherto alleged to contain conglutin and vitellin, this investigation was undertaken.

Almonds.

The proteid first discovered, which has since been known as conglutin, was found in the seed of the almond by Proust (Jour. de phys., de chim., d'histoire naturelle et des arts 54, 199) and by him named Amandin.

Dumas and Cahours (Jour. f. prakt. Chem. 28, 398) described and analyzed preparations obtained from almonds, peach and plum seeds, and considered them to be legumin, identical with that of a large number of other seeds.

According to Rochleder (Ann. der Chem. u. Pharm. 46, 155), the proteid described by Dumas and Cahours is different from legumin as understood by Liebig and others. Norton (Am. Jour. Science (2) V. 22) analyzed proteid preparations which he obtained from the almond and considered them to be legumin.

Ritthausen (Eiweisskörper, Bonn, 1872) described the proteid of the almond under the name conglutin. He later (Jour. f. prakt. Chem. 26, 422, 1882) obtained from the peach kernel a proteid which he considered to be conglutin, identical with that of almonds and lupins.

The details of our investigation are as follows: A quantity of sweet almond meats deprived of the brown skin (tegmen) were crushed and treated with ether to remove oil. Seventy-five grams of the oil-free meal were then extracted with ten per cent. sodium chloride solution, the extract was filtered clear and dialyzed until free from chlorides. The globulin separated at first in minute spheroids, which, on settling to the bottom of the dialyzer, united, forming a viscid semi-fluid translucent mass of a pale straw color. After decanting the solution, the globulin, which had separated, was again dissolved in ten per cent. sodium chloride brine and reprecipitated by dialysis. The proteid, obtained in the same condition as before, was washed with water, and with alcohol, dilute at first and afterwards gradually increased in strength, and finally was dehydrated with absolute alcohol and dried over sulphuric acid. This preparation, **1**, weighed 6.72 grams, was a snow white, dense powder, and, after drying at 110°, gave the following results on analysis:

AMANDIN, **1**.

				Average.
Carbon	51.49	51.32	----	51.41
Hydrogen	7.33*	6.86	----	6.86
Nitrogen	19.29	19.52	19.62	19.47
Sulphur	0.39	----	----	0.39
Oxygen	----	----	----	21.87
				100.00
Ash	0.24			

Another preparation of this globulin was made by crushing a quantity of fresh, shelled, "Jordan almonds," and extracting the oil with petroleum naphtha. After freeing from naphtha, the greater part of the skins was separated by sifting. 100 grams of the meal were then extracted with one liter of water and the solution filtered and saturated with ammonium sulphate. The precipitate produced was filtered out, dissolved in water, the resulting solution filtered perfectly clear and dialyzed until free from chlorides. The proteid which on dialysis deposited with the same appearance and characters as the first preparation, was washed with water, dilute alcohol, stronger alcohol and then dehydrated with absolute alcohol and dried over sulphuric acid. Sixteen grams were obtained, equal to sixteen per cent. of the meal. This preparation, owing to the seed-integument, which had been but partly removed, was somewhat red in color. After drying at 110°, analysis gave the following results:

---

* Omitted in average.

AMANDIN, 2.

			Average.
Carbon	51.49	----	51.49
Hydrogen	6·85	----	6.85
Nitrogen	19.27	19.05	19.16
Sulphur	0.44	----	0.44
Oxygen	----	----	22.06
			100.00
Ash	0.80		

For a third preparation Jordan almonds were drenched with hot water for a moment to loosen the skins, which were then easily detached; the meats were squeezed in a drug press to separate the greater part of the oil. The remainder of the oil, after dehydrating the pressed meats with absolute alcohol, was extracted with naphtha. The residue was freed from naphtha by evaporation and ground to a fine powder. There was thus obtained from 900 grams of almonds 380 grams of oil-free meal. This was thoroughly extracted with ten per cent. sodium chloride brine and the extract filtered. A turbid liquid resulted which was saturated with ammonium sulphate. The proteid thus precipitated was dissolved in ten per cent. sodium chloride brine and the solution after filtering perfectly clear was dialyzed until nearly free from chlorides. The solution was then decanted from the semi-fluid, viscid precipitate which had formed, and this was washed with water and alcohol, dehydrated with absolute alcohol and dried over sulphuric acid. The proteid thus obtained weighed sixty-six grams. The filtrate from this preparation was saturated with ammonium sulphate, the precipitate was filtered out, dissolved in a little water and the filtered solution was dialyzed. This second dialysis yielded twenty-seven grams more of globulin, which were added to that before obtained, making in all ninety three grams, being twenty-four and one-half per cent. of the oil-free meal. Analysis of this preparation, **3**, dried at 110°, gave results as follows:

AMANDIN, 3.

			Average.
Carbon	51.18	----	51.18
Hydrogen	6.99	----	6.99
Nitrogen	19.30	19.37	19.33
Sulphur	0.48	----	0.48
Oxygen	----	----	22.02
			100.00
Ash	0.35		

A portion of **3** was dissolved in sodium chloride solution and dialyzed into dilute alcohol in the hope of obtaining the globulin in the form of crystals. No distinct crystals resulted, and after remaining about two weeks in alcohol the precipitated proteid was readily redissolved in salt solution, not having been coagulated by the alcohol, and the clear solution was dialyzed in water until free from chlorides. After washing and drying in the usual manner this preparation, **4**, was analyzed:

AMANDIN, 4.

	I.	II.	Average.
Carbon	51.39	51.32	51.36
Hydrogen	6.99	6.90	6.95
Nitrogen	19.32	19.36	19.34
Sulphur	0.45	----	0.45
Oxygen	----	----	21.90
			100.00
Ash	0.20		

Peach Kernel.

Ritthausen states that peach seeds contain the same proteid as the almond, a fact in harmony with the close botanical relations of the two plants.

We obtained this proteid from peach pits in the following manner: The seeds were freed from the skin (tegmen) by cutting it away with a knife and were then ground with ether to a powder and freed from oil. Only a small quantity of seeds, yielding but twenty grams of oil-free meal, were at the time available. This was extracted with ten per cent. sodium chloride solution and the clear filtered extract dialyzed. The globulin separated in spheroids, which settled to a translucent viscid semi-fluid mass like that from the almonds. The solution, when freed from chlorides by dialysis, was decanted from the precipitate and the latter was washed with water, alcohol and absolute alcohol and dried over sulphuric acid; 2.44 grams or 12.2 per cent. of the meal were so obtained. Analysis of this preparation gave the following results:

AMANDIN, FROM THE PEACH, **5.**

			Average.
Carbon	51.06	51.02	51.04
Hydrogen	6.86	6.79	6.83
Nitrogen	19.20	19.35	19.28
Sulphur	0.48	----	0.48
Oxygen	----	----	22.37
			100.00
Ash	0.62		

Owing to the small quantity of **5**, it was not possible to compare its reactions throughout with those of amandin from the almond, but, so far as could be observed, the two were identical in all respects, and there can be no doubt that they are the same substance.

In the following table the foregoing results may be compared with those obtained by earlier investigators, in their work upon the proteid of the almond, peach and plum:

AMANDIN.

	Dumas and Cahours.		Löwenburg.	Norton.		
	Almonds.	Plums.	Almonds.		Almonds.	
Carbon	50.89	50.93	51.10	50.50	50.97	49.16
Hydrogen	6.71	6.73	7.20	6.56	6.64	6.51
Nitrogen	18.93	18.64	----	17.33	17.15	17.43
Sulphur	----	----	----	0.32	0.27	0.41
Phosphorus	----	----	----	1.05	0.57	2.21
Oxygen	23.47	23.70	----	24.24	24.40	24.27
	100.00	100.00		100.00	100.00	100.00

Ritthausen.

	Almonds.	Peach.
Carbon	50.44	50.82
Hydrogen	6.85	6.94
Nitrogen	18.61	18.60
Sulphur	0.43	0.32
Oxygen	23.67	23.32
	100.00	100.00

AMANDIN.

	Osborne and Campbell. Almonds.				Peach.	
	1.	2.	3.	4.	5.	Average.
Carbon	51.41	51.49	51.18	51.36	51.04	51.30
Hydrogen	6.86	6.85	6.99	6.95	6.83	6.90
Nitrogen	19.47	19.16	19.33	19.34	19.28	19.32
Sulphur	0.39	0.44	0.48	0.45	0.44	0.44
Oxygen	21.87	22.06	22.02	21.90	22.37	22.04
	100.00	100.00	100.00	100.00	100.00	100.00

Amandin, that has been dried over sulphuric acid, when mixed with cold water dissolves to a very slight extent and forms a gummy plastic mass. In water heated to about 98° amandin melts to a transparent mass and a considerable portion goes into solution, which in part separates out on cooling, and is redissolved on heating again. Boiling the solution causes but a slight turbidity.

The precipitate formed by cooling the hot water solution of amandin, dissolves completely on addition of a little nitric acid, but if more nitric acid be added, a precipitate falls which dissolves on warming and reappears on cooling in exactly the manner of a proteose.

In ten per cent. sodium chloride solution this proteid dissolves readily to a slightly opalescent liquid, no insoluble "albuminate" being formed by drying, as is the case with most vegetable globulins.

A solution containing ten per cent. of amandin dissolved in ten per cent. sodium chloride brine gives an abundant precipitate when poured into much distilled water, but if only a small amount of proteid is dissolved in the brine no precipitate is produced by dilution.

Salt solution of amandin is not precipitated by saturating with sodium chloride. By saturating with magnesium sulphate it is partly thrown down. Saturation with sodium sulphate or ammonium sulphate completely precipitates it.

Nitric acid added to the sodium chloride solution forms a precipitate soluble in an excess of acid which, on heating, gives the usual xanthoproteic reaction.

With mercuric chloride solution no precipitate is formed.

With picric acid and also with tannic acid heavy precipitates are produced.

Amandin is readily soluble in very dilute acetic acid. The acetic solution yields an abundant precipitate with potassium ferrocyanide that is difficultly soluble in an excess of this salt to a solution precipitable by diluting with water. In concentrated glycerine the dry proteid dissolves quite readily, the clear solution yielding a considerable precipitate on adding absolute alcohol.

Concentrated hydrochloric acid dissolves it, with development of a violet-blue color on standing. By heating in quite dilute sulphuric acid a solution is obtained which becomes turbid on cooling, the proteid being far less soluble in sulphuric than in hydrochloric or acetic acids. With the biuret test and also with glacial acetic acid and concentrated sulphuric acid together, solutions of this globulin give a fine violet color.

After solution in very dilute potash water and precipitation by neutralizing with acetic acid, amandin retains its original solubility in salt solutions.

A ten per cent. sodium chloride solution, containing five per cent. of amandin, becomes turbid when heated to 75°, and at 80° flocks form in small quantity which slowly increase on gradually raising the temperature, but only a small part of the proteid is coagulated even by boiling.

Having thus, as we believe, established this proteid as a chemical species quite distinct from all others hitherto investigated, it is proper to restore the designation *Amandin* given it by Proust, its discoverer, and to discard for it the names vitellin and conglutin, which are associated with many erroneous statements as to its occurrence, composition and characters.

Walnut, Juglans regia.

Ritthausen (Jour. f. prakt. Chem., 24, 257) prepared the proteid from this seed, but owing to the large amount of tannin present in the skins, he found much difficulty in obtaining satisfactory results.

As Ritthausen's preparations differed widely in composition, and as he has published nothing respecting the properties of this proteid, we have made several preparations with the following results.

A quantity of walnut meats was crushed, freed from oil by extracting with petroleum naphtha, and the greater part of the skins removed by sifting. One hundred grams of this meal were then extracted with ten per cent. sodium chloride brine and, after filtering, eight-tenths of the salt solution applied was recovered as a clear extract corresponding to about eighty grams of meal. This was saturated with ammonium sulphate and the resulting precipitate filtered out and treated with salt solution. Much that failed to dissolve was separated by filtration and the clear solution was dialyzed until free from chlorides. During dialysis the proteid was deposited in spheroids which did not, like amandin, unite to a confluent mass. The precipitated globulin was then filtered out, washed with water, alcohol and absolute alcohol and dried over sulphuric acid. Only 2.87 grams were obtained, equal to about 3.6 per cent. of the meal. This small yield was undoubtedly due to tannin, which rendered the greater part of the proteid insoluble in salt solution.

Dried at 110° this preparation, **6**, had the following composition:

WALNUT GLOBULIN, CORYLIN, **6.**

			Average.
Carbon	50.32	50.32	50.32
Hydrogen	6.63	6.74	6.69
Nitrogen	19.06	19.12	19.09
Sulphur	----	----	23.90
Oxygen	----	----	
			100.00
Ash	0.63		

The part of the ammonium sulphate precipitate which was not taken up by salt solution at 20° was treated with brine at 60°. In this it dissolved almost completely and did not precipitate on cooling. The clear filtered solution was dialyzed free from chlorides, and by the usual process, 2.82 grams or 3.5 per cent. of globulin were obtained, having the following composition:

WALNUT GLOBULIN, CORYLIN, **7.**

Carbon	50.83	
Hydrogen	6.79	
Nitrogen	19.05	19.04
Sulphur	0.89	
Oxygen	22.44	
	100.00	
Ash	0.15	

In order to avoid the presence of tannin, another lot of walnut seeds were drenched for a moment with hot water, whereupon the skins were easily stripped off. The crushed meats were then treated with ether to extract the oil and, after removal of ether by exposure to the air, the coarse meal was finely ground and fifty grams were extracted with fifteen hundred cubic centimeters of ten per cent. brine of common salt. The extract was filtered clear, saturated with ammonium sulphate, the resulting precipitate dissolved in salt solution at 40° and the extract dialyzed free from chlorides. The precipitated globulin was then filtered out and treated in the usual manner, giving preparation 8, weighing 10 grams, equal to 20 per cent. of the meal, and having the following composition:

WALNUT GLOBULIN, CORYLIN, 8.

			Average.
Carbon	50.77	50.74	50.76
Hydrogen	6.94	6.83	6.89
Nitrogen	19.10	19.02	19.06
Sulphur	----	----	23.29
Oxygen	----	----	
			100.00
Ash	0.32		

Hazel-nut or Filbert, Corylus tubulosa.

Ritthausen (Jour. f. prakt. Chem., 24, 257) has detailed the results of his examination of the proteid of this seed and concluded it to be identical with the conglutin which he obtained from almonds.

In order to satisfy ourselves respecting this substance a quantity of hazel-nut meats was freed from skins and oil as already described in case of walnuts, and finely pulverized. The meal was then extracted with ten per cent. sodium chloride brine and the filtered extract saturated with ammonium sulphate. The precipitated proteid was filtered out, dissolved in salt solution, and the liquid, after filtering clear, was dialyzed free from chlorides.

During dialysis the globulin separated in spheroids which, like those of walnut globulin, settled down, without adhering together to a plastic mass, after the manner of amandin. The precipitated globulin was filtered out and treated in the usual way. When dried at 110° this preparation had the following composition:

Corylin, Filbert Globulin, 9.

			Average.
Carbon	50.64	50.80	50.72
Hydrogen	lost	6.86	6.86
Nitrogen	19.14	19.19	19.17
Sulphur	0.83	----	0.83
Oxygen	----	----	22.42
			100.00
Ash	0.28		

In properties this preparation exactly resembled the globulin obtained from the walnut. That the two are identical in composition is shown by the following statement:

Corylin.

	Walnuts			Filberts.
	6	7	8	9
Carbon	50.32	50.83	50.76	50.72
Hydrogen	6.69	6.79	6.89	6.86
Nitrogen	19.09	19.05	19.06	19.17
Sulphur	23.90	0.89	23.29	0.83
Oxygen		22.44		22.42
	100.00	100.00	100.00	100.00

The properties of this proteid, after drying over sulphuric acid, as exhibited by preparations 8 and 9, are as follows. In the dry state it forms a heavy snow-white powder which, unlike amandin, is entirely insoluble in distilled water at 20° or at 40°. In ten per cent. sodium chloride solution it dissolves readily and completely, as also in exceedingly dilute acids and alkalies. Sulphuric acid, however, dissolves it much less readily than acetic, hydrochloric or nitric acid.

The solution in ten per cent. sodium chloride brine, containing ten per cent. of this globulin, gives an abundant precipitate when diluted with an equal volume of water. More dilute solutions give precipitates on sufficient dilution. Corylin is very much more readily precipitated by dilution than amandin. Hydrochloric acid and acetic acid each gives a precipitate insoluble in considerable excess of acid, when added to saline solutions of the proteid. With mercuric chloride, picric acid, or tannic acid dissolved in ten per cent. sodium chloride brine, heavy precipitates are produced. Saturation with sodium chloride gives a slight precipitate. Saturation with magnesium sulphate produces a considerable though partial precipitation. Saturation with sodium sulphate or ammonium sulphate effects a complete precipitation.

Dissolved in a little acetic acid, a precipitate is produced by sufficient nitric acid, which dissolves on heating and partly reprecipitates on cooling. The solution in acetic acid gives a precipitate with ferrocyanide of potassium, but slightly soluble in a large excess of the latter.

With the biuret test the usual violet color is obtained. With Millon's and the xanthoproteic tests the ordinary proteid reactions appear. Dissolved in concentrated hydrochloric acid and boiled, a violet blue color develops on standing.

With glacial acetic acid and concentrated sulphuric acid, solutions of corylin give a violet color. When five per cent. of this proteid is dissolved in ten per cent. sodium chloride brine and the solution heated, turbidity ensues at about 80° and flocks form in small amount at 99°. On boiling the solution, a little more coagulates, but the corylin is precipitated by heat very slowly and incompletely.

When dissolved in dilute potash water and precipitated by neutralization, the proteid dissolves completely in ten per cent. salt solution. These reactions and the results of analysis show this body to be entirely distinct from either amandin or edestin. We therefore propose the name *Corylin*, from the generic name of the filbert, *Corylus tubulosa*, in which this proteid was first found by Dumas and Cahours (Jour. f. prakt. Chem., 28, 398).

Brazil-nut, Bertholletia excelsa.

Weyl (Zeitschr. f. physiol. Chem., 1, 85) described the globulin of the Brazil-nut under the name of vegetable vitellin, and first determined its composition with a close approach to accuracy.

One of us has already investigated this substance as to its composition and properties, when prepared both in the form of spheroids and as perfectly distinct crystals (Osborne, Am. Chem. Jour., 14, 662). This proteid, being evidently different from all others hitherto examined, deserves a distinct name, and we accordingly propose to designate it *Excelsin.*

Oat-kernel.

From the oat-kernel one of us (Osborne, Reports of this Station 1890 and 1891, and Am. Chem. Jour., 14, 212 and 682) obtained a crystallized globulin very similar in composition to excelsin, but different in its reactions as well as in crystalline form. This globulin might be classed as a vitellin, and for that reason is here referred to. As yet this proteid has received no specific name and we now propose to call it *Avenalin.*

Hemp, Cannabis sativa; Squash, Cucurbita maxima, and Castor Bean, Ricinus communis.

Proteid preparations from the seeds of hemp, squash and castor bean have been described under the names of conglutin and vitellin. One of us (Osborne, Am. Chem. Jour., 14, 671–689) has shown that these seeds contain, as their chief and characteristic proteid, one and the same substance and has named it *Edestin.* This has been found in a larger number of seeds than any proteid yet discovered, and is the body most commonly called vegetable vitellin. It is readily obtained pure in octahedral crystals, from several seeds, and owing to this fact has been employed in physiological investigations. That it is a different substance from the proteids already described in this article appears to have been mostly overlooked. The properties and composition of edestin are detailed in the paper above mentioned, and in the Annual Reports of this Station for 1893, pp. 179, 214, 216, and 1894, pp. 155, 170, 190.

Coconut, Cocos nucifera.

The proteid of the coconut was examined by Ritthausen (Pflüger's Archiv., 21, 96), who, without identifying it with conglutin, assigned to it a similar composition. Chittenden (Medical Record, 45, 450, and Digestive Proteolysis, New Haven, 1895, p. 32), under the general name phytovitellin, gives the composition of this proteid in close accord with that of edestin, and as he obtained it partly crystallized in octahedra it probably is edestin.

Lupin, Lupinus.

The principal proteid contained in lupin seeds is the body to which Ritthausen first gave the name conglutin (Eiweisskörper, Bonn, 1872, and Jour. f. prakt. Chem., 25, 422). We have devoted much labor to the study of this proteid, but the results of our work are not yet complete and will form the subject of a future paper. We find that it is distinctly different in composition and properties from the proteids which we have hitherto noticed, and we take especial pleasure in confirming to it the name *Conglutin* proposed by its veteran discoverer.

We give on page 301 the composition of conglutin as found by us in accordant analyses of six preparations from the blue lupin.

Sunflower, Helianthus.

The proteid of the sunflower seed as described by Ritthausen (Pflüger's Archiv., 21, 81) appears to be identical with edestin, but our investigation of this substance, which is still in progress, shows that the proteid prepared by the usual methods is contaminated with the helianthotannic acid described by Ludwig and Kromayer (N. Br. Arch., 99, 1 and 285). As yet we have been unable to obtain this proteid in the pure state.

To the best of our knowledge the proteids noticed in this paper include all which have been hitherto designated either as conglutin or vitellin. Of late years many seeds have been described as containing vitellin, but its presence has been inferred from qualitative reactions and not, except in those cases mentioned in this paper, from a study of the isolated proteid.

We have accordingly at least six perfectly distinct proteids which have been confounded together under the name vitellin or conglutin. The following table shows the present state of our knowledge concerning the composition of these globulins and sets forth the characters in which they have been found to differ.

PROTEIDS FORMERLY KNOWN AS VITELLIN OR CONGLUTIN.

	EDESTIN.	AMANDIN.	CORYLIN.	EXCELSIN.	AVENALIN.	CONGLUTIN.
Carbon	51.65	51.30	50.72	52.18	52.18	51.00
Hydrogen	6.89	6.90	6.86	6.92	7.05	6 90
Nitrogen	18.75	19.32	19.17	18.30	17 90	17.99
Sulphur	0.85	0.44	0.83	1.06	0.53	0.40
Oxygen	21.86	22.04	22.42	21.54	22.34	23.71
	100.00	100.00	100.00	100.00	100.00	100.00
Salt solution saturated with—						
Sodium chloride.	No pp.	No pp.	No pp.	No pp.	Complete pp.	No pp.
Magnesium sulphate.	Complete pp.	Partial pp.	Partial pp.	Slight pp.	Complete pp.	No pp.
$HgCl_2$.	Pp.	No pp.	Pp.	No pp.	Pp.	No pp.
Solution of 10% proteid and 10% sodium chloride diluted with equal volume of water gives—	Pp.	No pp.	Pp.	Slight pp.	Pp.	No pp.
Heat coagulation—					No coagulation even on boiling.	Trace of coagulation at 99°, sets to jelly on cooling.
Turbidity.	88°	75°	80°	70°		
Flocks.	95°	80°	99°	84°		
Precipitate by dialysis,	Octahedral crystals or spheroids, pulverulent.	Spheroids, uniting to viscid semifluid.	Spheroids, pulverulent.	Hexagonal plates or spheroids, pulverulent.	Spheroids, pulverulent.	Spheroids uniting to plastic mass.
Found in seeds of—	Hemp, Castor bean, Squash, Flax, Cotton, Wheat, Rye, Barley, Maize, Coconut.	Almond, Peach.	Walnut, Filbert.	Brazil-nut.	Oat.	Lupin.

RECENT LEGISLATION AFFECTING THE STATION.

In the Report of the Board of Control, page xv, mention is made of Acts affecting this Station, passed by the General Assembly at the January session, 1895.

The text of these Acts is here printed in full.

It was intended to print in this Report an account of work done under the Food Act during the last quarter of the State fiscal year of 1895, but various causes have rendered it impracticable to do so, and with consent of the Governor this account will be printed in the next Report and at an early date.

[Substitute for House Bill No. 16.]

An Act making an Appropriation to the Connecticut Agricultural Experiment Station.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. The further sum of two thousand dollars annually is hereby appropriated to the Connecticut Agricultural Experiment Station, to be paid in the same manner as now provided by section 1714 of the general statutes; and the treasurer of the board of control of said station, before any of the money hereby appropriated is paid, shall give an additional bond in the sum of four thousand dollars, and hereafter on any subsequent appointment such treasurer shall give bond with surety to the State of Connecticut in the sum of fourteen thousand dollars, for the faithful discharge of his duties as such treasurer.

SEC. 2. The sum of two thousand five hundred dollars is hereby appropriated to the Connecticut Agricultural Experiment Station for the purpose of better equipping, and making additions to, the chemical and botanical laboratories of said station, for building and equipping vegetation houses on the land of said station, to be used for the purposes of said station, and to aid in experiments in the fermentation and cure of tobacco on the land of the Connecticut Tobacco Experiment Company in the town of Windsor; the said sum to be paid only on vouchers approved by the director or vice-director of said station, and filed with the comptroller, who is hereby directed to draw his order for the payment of the same.

SEC. 3. This act shall take effect from its passage.

Approved, June 26, 1895.

[Senate Bill No. 167.]

CHAPTER CCXXXV.

An Act regulating the Manufacture and Sale of Food Products.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Manufacture or sale of misbranded or adulterated food.

SECTION 1. It shall be unlawful for any person, persons, or corporation within this state to manufacture for sale, offer, or expose for sale, have in his or their possession for sale, or to sell, any article of food which is adulterated or misbranded within the meaning of this act.

Term food defined. Term misbranded defined.

SEC. 2. The term food, as used in this act, shall include every article used for food or drink by man, horses, or cattle. The term misbranded, as used in this act, shall include every article of food and every article which enters into the composition of food, the package or label of which shall bear any statement purporting to name any ingredient or substance as not being contained in such article, which statement shall be untrue in any particular; or any statement purporting to name the substance or substances of which such article is made, which statement shall not give fully the names of all substances contained in such article in any measurable quantity.

When an article shall be deemed to be adulterated.

SEC. 3. For the purposes of this act, an article shall be deemed adulterated: First, if any substance or substances be mixed or packed with it so as to reduce or lower or injuriously affect its quality or strength; second, if any inferior substance or substances be substituted wholly or in part for the article; third, if any valuable constituent of the article has been wholly or in part abstracted; fourth, if it be an imitation of or sold under the name of another article; fifth, if it is colored, coated, polished, or powdered whereby damage is concealed, or if it is made to appear better or of greater value than it is; sixth, if it contains poisonous ingredients which may render such article injurious to the health of a party consuming it, or if it contain any antiseptic or preservative not evident and not known to the purchaser or consumer; seventh, if it consists, in whole or in part, of a diseased, filthy, decomposed, or putrid substance, either animal or vegetable, unfit for food, whether manufactured or not, or if it is in any part the product of a diseased animal, or of any animal that has died otherwise than by slaughter; *provided*, that an article of food product shall not be deemed adulterated or misbranded within the meaning of this act in the following cases: (*a*) In the case of mixtures or compounds which may be now or from time to time hereafter known as articles of food under their own distinctive names, and not included in definition fourth of this section; (*b*) in the case of articles labeled, branded, or tagged, so as plainly and correctly to show that they are mixtures, compounds, combinations, or blends; (*c*) when any matter or ingredient is added to a food because the same is required for the protection or preparation thereof as an article of commerce in a fit state for carriage or consumption, and not fraudulently to increase the bulk, weight, or measure of the food or to conceal the inferior quality thereof; (*d*) when a food is unavoidably mixed with some extraneous matter in the process of collection or preparation.

Connecticut Agricultural Experiment Station to make analyses.

SEC. 4. The Connecticut Agricultural Experiment Station shall make analyses of food products on sale in Connecticut suspected of being adulterated, at such times and places and to such extent as it may determine, and may appoint such agent or agents as it deems necessary; who shall have free access, at all reasonable hours, for the purpose of examining, into any place wherein it is suspected any article of food adulterated with any deleterious or foreign ingredient or ingredients exists, and such agent or agents upon tendering the market price of said article may take from any person, firm, or corporation samples of any article suspected of being adulterated as aforesaid, and the said station may adopt or fix standards of purity, quality, or strength when such standards are not specified or fixed by statute.

Notice to prosecuting officers.

SEC. 5. Whenever said station shall find by its analysis that adulterated food products have been on sale in the state, it shall forthwith transmit the facts so found to a grand juror or prosecuting attorney of the town in which said adulterated food product was found.

Report.

SEC. 6. The said station shall make an annual report to the governor upon adulterated food products, in addition to the reports required by law, which shall not exceed one hundred and fifty pages, and said report may be included in the report which said station is already authorized by law to make, and such annual reports shall be submitted to the general assembly at its regular session.

Appropriation.

SEC. 7. To carry out the provisions of this act, the additional sum of twenty-five hundred dollars is hereby annually appropriated to said Connecticut Agricultural Experiment Station, which sum shall be paid in equal quarterly installments to the treasurer of the board of control of said station, upon the order of the comptroller, who is hereby directed to draw his order for the same.

Penalty.

Sec. 8. Any person who, either by himself, his agent, or attorney, with the intent that the same may be sold as unadulterated, adulterates any food products for man, or horses, or cattle, or knowing that the same has been adulterated, offers for sale or sells the same as unadulterated, or without disclosing or informing the purchaser that the same has been adulterated, shall be fined not more than five hundred dollars, or imprisoned not more than one year.

Action not to be maintained on illegal sale.

Sec. 9. No action shall be maintained in any court in this state on account of any sale or other contract made in violation of this act.

Sec. 10. All acts and parts of acts inconsistent herewith are hereby repealed.

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ANNUAL REPORT

OF THE

TRUSTEES

OF THE

STORRS AGRICULTURAL COLLEGE,

AT

MANSFIELD, CONN.

(P. O. STORRS, CONN.)

For the period embraced within the first day of December, 1894, and November 30, 1895.

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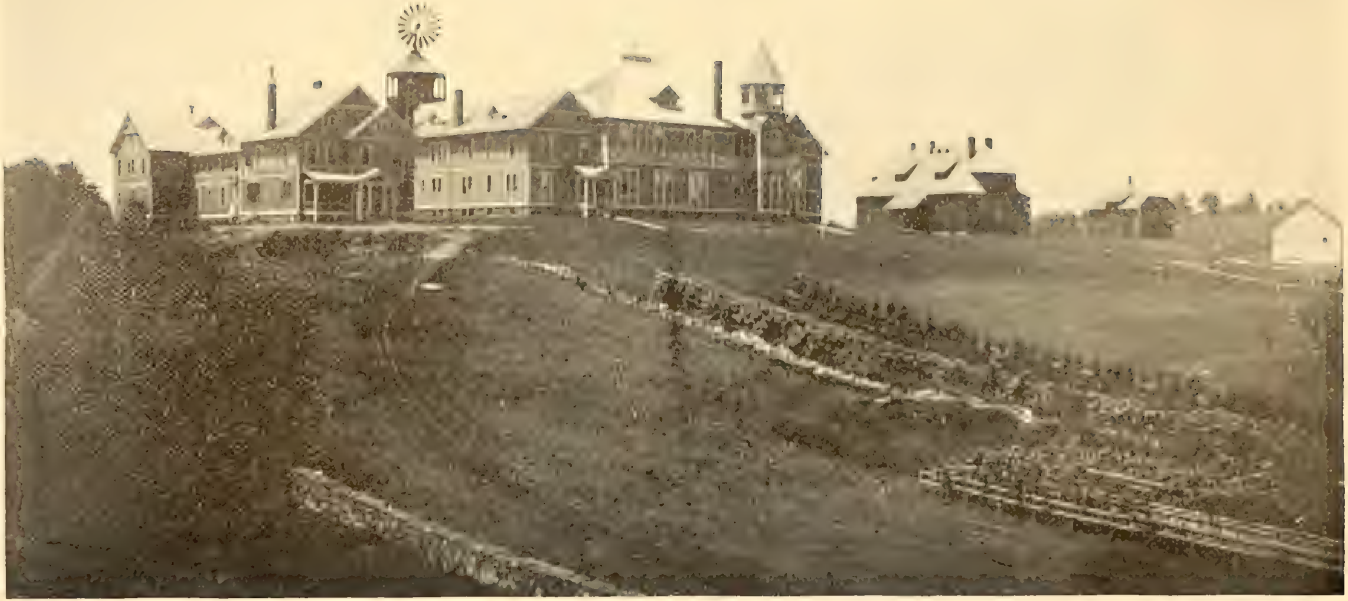
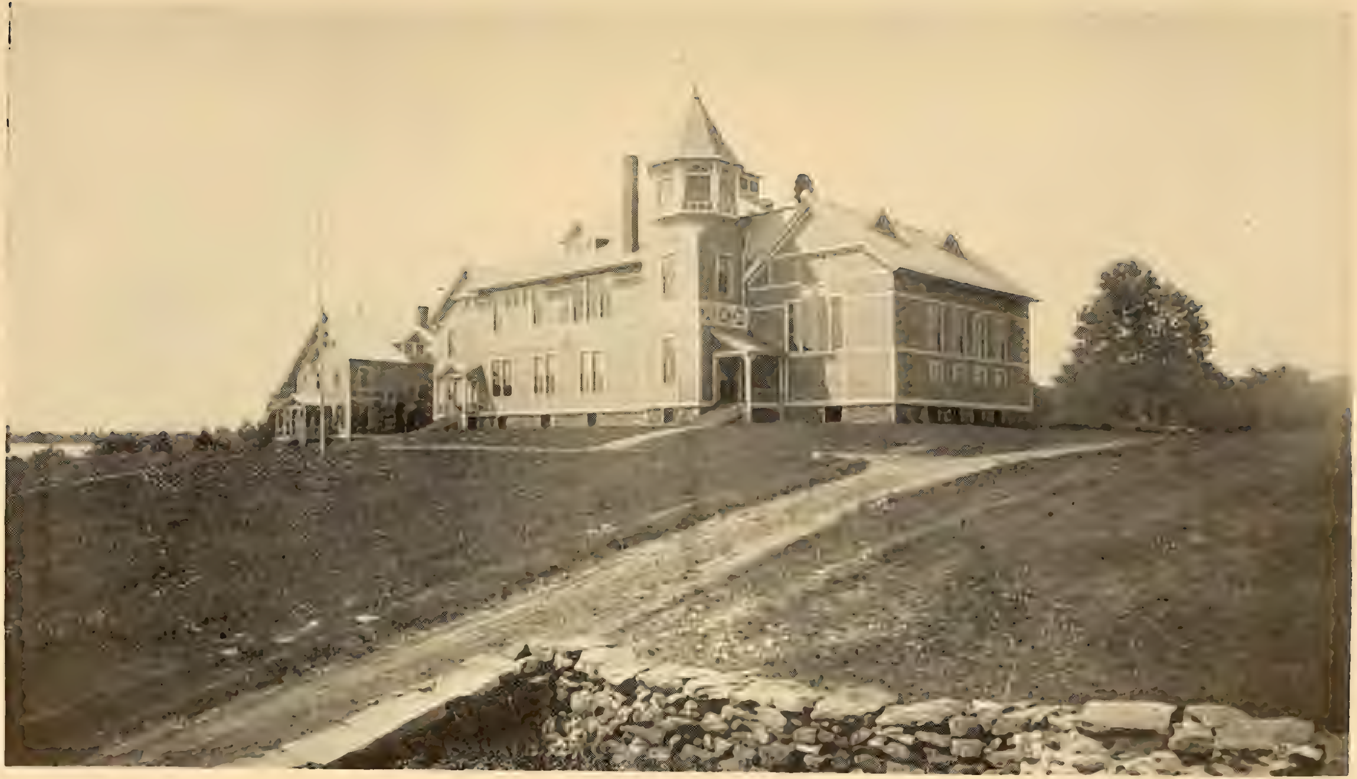


General View of College Buildings.



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O. F. TOWER,	Assistant Chemist.

State of Connecticut.

REPORT.

To his Excellency O. VINCENT COFFIN, *Governor of Connecticut:*

At this period of the growth of the college it seems proper to give a brief sketch of the history of the institution from its foundation.

LOCATION.—The college is situated in the northern part of the town of Mansfield, Tolland County, at an elevation of nearly 700 feet above sea level. The surface of the township is rolling or hilly, and no more healthful location, physical or moral, could have been chosen. The post office is Storrs, conveniently near. Railroad and express station is Eagleville, distant two and one-half miles on the New London Northern R. R., seven miles from Willimantic. Willimantic, which has numerous railroad facilities, is eight miles from the college. Telephone connections at the institution. The church of the Second Congregational Society of Mansfield appears in one of the accompanying engravings. Churches of other denominations are within convenient reach.

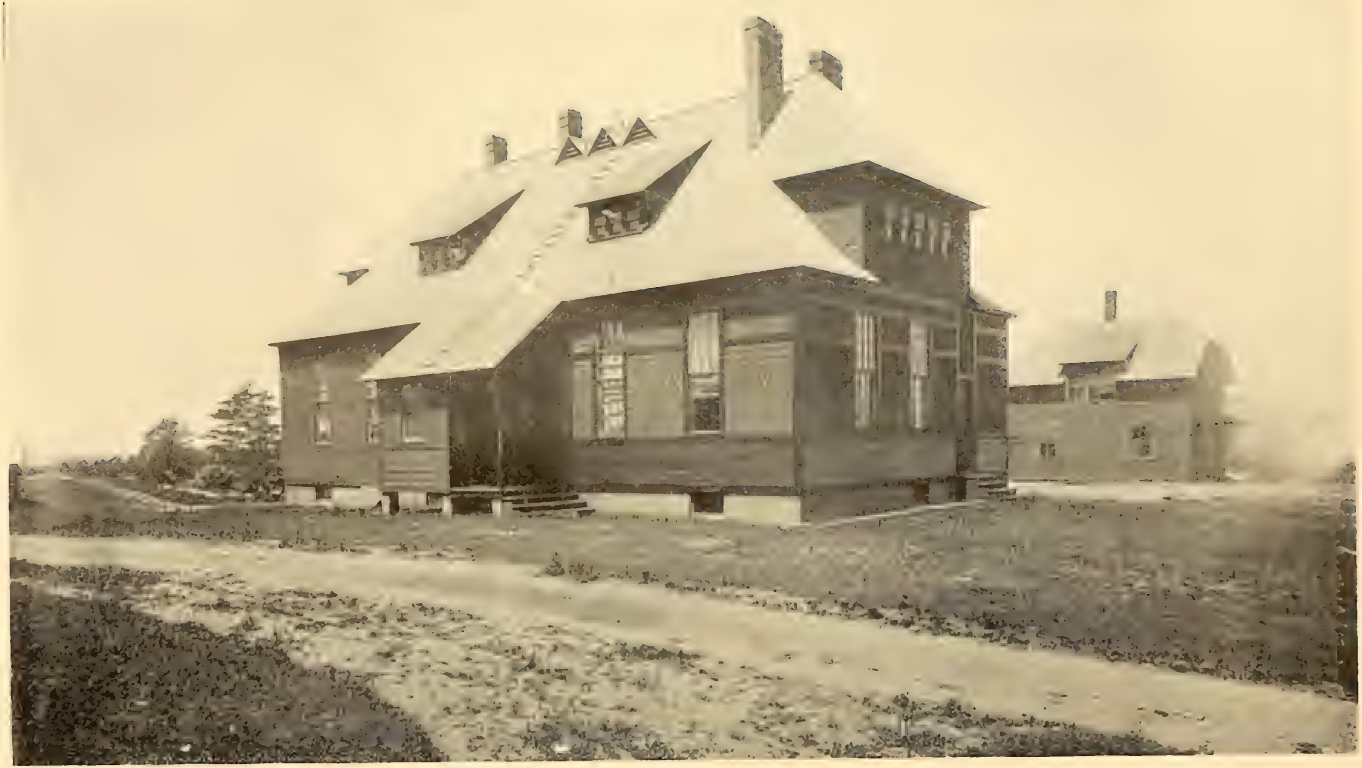
The Storrs Agricultural School was established by an Act of the General Assembly of the State of Connecticut, dated April 6, 1881, and commenced operations September 28, 1881.

Mr. Augustus Storrs of Mansfield gave a farm of one hundred and seventy acres, comprising the Whitney farm of fifty acres with one large building containing school-rooms, dormitories, etc., erected for a boys' boarding school, and occupied by the Soldiers' Orphans Home, with barn and other outbuildings still in use ; also, the Freeman farm adjoining of one hundred and twenty acres, with buildings. Mr. Charles Storrs gave five thousand dollars to equip the school and one thousand to drain a large swamp on the farm. Other gifts were added later by the Storrs brothers. The land was of full average quality for the State, with a variety of soil suitable for cultivation or pasturage, with a large swamp of twenty acres, but in a neglected condition. The State gave five thousand dollars annually for the running expenses of the school. The income from the farm and other sources has been largely devoted to the necessary improvement of the farm.

The Object of the School, as defined in the Act, "was the education of boys . . . . in such branches of scientific knowledge as shall tend to increase their proficiency in the business of agriculture." To make this education of the greatest value, practice in the field and the garden formed a part of the training of the pupils. Boys were taken right from the farm and the common schools and taught all that they could learn of scientific and practical agriculture, with such other branches of learning most necessary for the successful farmer as could be crowded into a two years' course.

In this line the school was a success. The annual appropriation was increased to eight thousand dollars, and appropriations were made at different times for buildings and other expenses. In 1888 a farm barn was built, well ventilated and lighted, 80×42 feet, costing five thousand dollars, and a chemical laboratory, 62×33 feet, one and one-half stories, costing eight thousand five hundred dollars. This building, besides the working laboratory, contains a private laboratory for the Professor of Chemistry and a chemical lecture room. In the upper story is the physical laboratory, a dark room for photography, and storage room for surveying instruments and other apparatus.

In 1890 the main school building and dormitory were erected at a cost of fifty thousand dollars. For the desired location of these buildings, Mr. Augustus Storrs gave a choice plot of ground of about two acres valued at five hundred dollars, occupied as his vegetable and fruit garden.



Chemical Laboratory and Experiment Station Office.

INTERIOR OF CHEMICAL LABORATORY.

THE MAIN BUILDING has on one end a chapel 50×30 feet; the central portion, 73×51, containing office, library, museum, seven recitation rooms and sitting room, and at the south end of this a kitchen department ell, 84×26 feet, with kitchen, Domestic Science laboratory, store-rooms and drill-room in the basement; dining room and pantry, rooms for lady principal, on the first floor; rooms for lady teachers, young lady pupils and servants on second floor and attic.

THE DORMITORY two stories, extreme length one hundred and twenty feet, extreme width fifty feet, in form of a double cross, contains residence for one instructor and twenty-four rooms for pupils. These were designed for single pupils, but now, from the necessities of the college, have been fitted to accommodate two in each room.

THE WATER SUPPLY is from a well in the rear of the main building eight hundred and fifty feet deep, mostly through solid rock, six-inch bore, which furnishes an abundance of the purest water, rising to within forty feet of the surface.

The cost of the well, tank, windmill and pump was ten thousand dollars. No amount of pumping or period of drought appears to materially affect the height of the water.

In this period of twelve years, previous to 1893, the school had made substantial growth. The teaching force had been increased, new departments of study introduced and provision made for a preparatory class, making three years of study for those not sufficiently advanced to enter upon the course of the second year.

The farm was much improved by clearing fields, building needed stone walls and other fences, planting an orchard, repairing the old farm-house, with other improvements of the land and buildings.

The swamp near the new barn was drained with a covered outlet of ten-inch cement sewer pipe, leading from a well into which empties the eight-inch main through the swamp; and also two five-inch laterals. The outlet is about five feet deep at the well, but is about nine feet a few rods below, then gradually grows more shallow until it comes to the surface on the Storrs property some thirty rods from the well. Broad, open ditches, were dug through the swamp. Thus far the thousand dollars of Mr. Charles Storrs in pursuance of the expressed wishes of the donor.

The swamp was covered with brush, the muck is six feet or more in depth, and little could be done without more drainage, as the water was supplied by springs on its extreme border from the outlet. The brush have been subdued, and a part has been mowed and a part pastured.

This year Professor Gulley of the Horticultural Department has taken the work in hand and thoroughly tiled ten acres. For particulars of this work, reference is made to his report.

In 1887 the Storrs Experiment Station was established by the General Assembly, this station receiving annually the sum of seven thousand five hundred dollars, being one-half of the amount appropriated by our National Congress to each State for experiment stations. The chemical work has been done at Middletown under the charge of Dr. W. O. Atwater, Director, and Professor C. D. Woods, Vice-Director of the Station. Here the station enjoys the free use of laboratory, library, &c. Only a very limited amount of this grant can be used for buildings. The State gives an annual appropriation of eighteen hundred dollars for investigation of Food Economy, and pays for the printing of the annual report of the station; the station pays for its bulletins and other printing; and the post office transports these documents free of postage.

The field work and feeding experiments are conducted at Storrs and elsewhere about the State by Professor C. S. Phelps, Agriculturist, and one assistant. The station building and barn, erected by an annual saving from the fund, are on the college farm, and the station occupies some dozen acres of the best farm land. The grass garden, the various forage crops, the testing of fruits, of fertilizers and cattle foods, while

Greenhouse.

Interior of Greenhouse.

some students find employment in this service, furnish to all object lessons that add to the educational power of the college.

The basement of the experiment station building is used by Professor Phelps for dairy instruction, yet here, as elsewhere, the small size of the room requires teaching by sections rather than by entire classes.

To make it more explicit, we repeat: The experiment station receives seven thousand five hundred dollars from the National Government and free postage on its documents. The State prints the annual report, twelve thousand copies, five thousand of which are bound with the report of the Board of Agriculture, and gives annually eighteen hundred dollars. Wesleyan University grants free use of laboratories and other important facilities and the use of the land for field experiments is given by the college.

During these fourteen years the farm has been largely improved in general condition and productiveness, notably during the last ten years under the efficient management of Professor Chamberlain, who does not know how to do anything in a slipshod or makeshift fashion, a habit so fatal to all the interests of American agriculture, both present and prospective. In the meantime the old farm-house has been thoroughly repaired, a new piggery, hennery with ample yard, and a cart-shed have been built.

The original school building has been shingled, repaired, and painted inside and out and a new heater and registers put in this last fall at a cost of one thousand dollars, so that members of the faculty and students have as good quarters there as in the other buildings.

The greenhouse for the Horticultural Department was erected in 1892, at a cost of about two thousand dollars, consisting of a headhouse, 20 × 20, two stories and basement, and under glass, 75 × 20 feet.

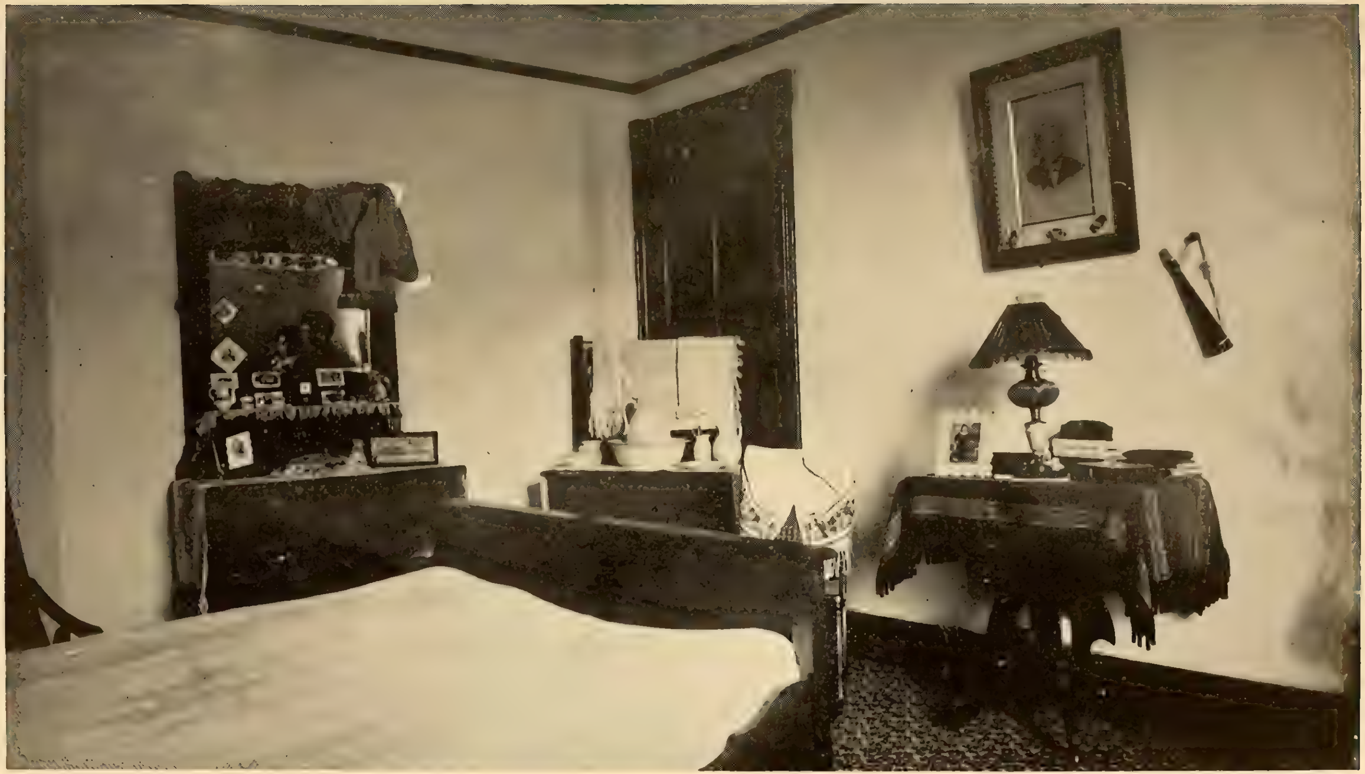
A shop has been fitted up with tools and some machinery for wood and iron work, but a considerable expenditure is needed for this department. There should be a building especially designed for this purpose fitted with tools, machinery and power. The rude fittings of an old-fashioned blacksmith's shop or carpenter's shop hardly answer for the purposes of instruction in the present day, so that while we have some good tools, and some good work is accomplished, yet the college should be so well equipped as to encourage the ingenious student in acquiring intelligent skill, and that also the dull and awkward one may learn that he can do good work. It matters little where a boy secures his first victory, whether it be in sports and games, in penmanship or figures, in trained muscle or brain, the sense of supremacy of power of body or mind is a great stimulus to further effort, and rightly directed, leads to the highest form of manhood, self control, without which all other acquirements are vain and unsatisfying.

A rocky piece of land adjoining the little half-natural pond in the rear of the buildings has been set apart for an arboretum, and specimens of most of the trees and shrubs of the vicinity have already been planted there. It is designed to make this a convenient object lesson for study, that the student may become familiar with all the trees and shrubs of our own forests and those of other lands adapted to our climate. A certain amount of study of books, and application, in the class-room is needed, but there is as much refreshment of mind and body in this open-air study as in any sports or games, and the freedom of intercourse between teacher and pupil should be worth more in influence upon habits and character than the same hours spent in the class-room.

But in this sketch of growth we have omitted the most important change in the institution.

Some of the students had progressed far enough to see the great advantages to be derived from further study in the various departments of science pertaining to agriculture, requiring a longer course and greater facilities than could be furnished by the school, and the General Assembly, in 1893, changed the name to Storrs Agricultural College, and appropriated, upon certain conditions, the amount given by Congress,

Planting Class Tree.



Lady Students' Room.

in the Act of 1862 and in the Act of 1890, for support of colleges for the benefit of agriculture and the mechanic arts, to the institution. Also provided twenty thousand dollars annually for two years for present support from the State treasury, as the disposal of this fund was an unsettled question. The present appropriation is twenty-five thousand annually for two years. As the question of the disposition of this fund is now before the arbitrators it requires no description here. We are confident that the State will sustain the college and provide for its wants as it grows, not only in numbers, but in the hearts of the people.

The United States appropriation cannot be used for buildings, so that the State is called upon, at any rate, to provide these necessities.

Among the changes made when the college was established was co-education, allowing the daughters as well as the sons to share in the privileges of the institution. The General Assembly of 1895 appropriated twelve thousand dollars for a girls' cottage, designed to accommodate the female students with their teachers. Plans are in preparation for erecting this building at an early date, so that it can be occupied in September, 1896. The young ladies share in the same course of study as the young men, but Domestic Science is substituted in place of Agriculture and Veterinary Science.

In the meantime much work has been done, not only in clearing the fields of the farm but roadways to reach them have been constructed, also necessary and convenient driveways about the grounds and buildings. Asphalt walks have been laid this present year to connect the various college buildings at a cost of three hundred dollars. In connection with the Horticultural department an orchard of numerous varieties of fruits has been planted and a vineyard to test all the varieties of grapes suited to our climate. The farm barns of the Soldiers' Orphans Home are still in use for horses, and have had only temporary repairs, as their location is such as to demand their removal as soon as funds are provided for the change.

Various other changes have been imperative, as the institution became a college. The three years' course has been extended to four, including the preparatory year. A department of Veterinary Science, in charge of Dr. Waterman, has been established. In the weekly clinics, diseased animals brought to the college receive free treatment, adding much to the value of the class-room instruction. Military drill is also in charge of Professor Waterman.

The department of Horticulture, in charge of Professor Gulley, is in active operation. New heating apparatus has been put into the greenhouse for efficiency and economy. Details are given elsewhere.

The study of English is absolutely necessary in any institution of learning, and this department is in charge of Professor Lewis. The time has gone by when agriculture should be willing to remit to other callings in life—the privileges, the refinement of thought and living to be gained by the study of history, language and literature. To read, speak and write our native tongue with precision and force are worthy objects of study by every young man or woman.

The Library needs our notice. It is growing, but requires more money to provide the best issues of the press upon the various subjects of science and life of this progressive age.

The short summer course, which has been recently provided, is designed to be eminently practical in its character. All candidates for a degree are required to take this course for one year. But it is not confined to them. Here is offered all the privileges of instruction furnished by the college, while nature will do the rest. Health and strength, vigor of mind and body, pleasant employment, as much as can anywhere be gained in the summer vacation, are here offered to any young men who desire such privileges and will use them rightly.

This work of the college, we believe, has only to be known to be appreciated.

In conclusion we are able to say that our various departments are well equipped for their work, but the growth of the institution honestly demands some things called for by the

Military Companies

instructors in their accompanying reports, so that we can heartily endorse their requests. Especially do we need another dormitory for the boys; a dairy building; a boarding hall separate from the main school-building; a hospital building in case of contagious disease; a working laboratory for the veterinary department; a separate building for wood and iron work. These are our most urgent demands, and those who expect that the boys and girls of the State are agoing to be satisfied until these are provided, do not read aright the progressive spirit of the age, and we, as almoners of the State's bounty, must be allowed to urge their claims upon the State for liberal provision for education in that art, the basis of all arts, agriculture.

Since preparing the foregoing report, a very important transaction in the interests of the college has been consummated.

The proposed location of the ladies' dormitory or cottage was found not ample enough for the purpose, and negotiations for the purchase of a part of the Crane farm of the estate of the late Augustus Storrs for this object has resulted in the purchase of the whole Crane farm, a tract of one hundred and twenty-five acres adjoining the college property on the south, at a price of six thousand dollars.

This will furnish a fine location for the girls' building with ample grounds. The college drill-ground is also a part of this property. It has a large, much-needed new barn, 40×80 feet, thoroughly built, which will allow of the removal of the old barns that now disfigure the college campus.

Some twenty-five acres are in heavy timber, and the whole is in first-class condition, furnishing a much-needed addition to the resources of the farm in furnishing milk and other products for the college.

You are referred to abstracts from reports received from the Faculty as to the course of instruction pursued and the wants of the various departments of the college, and to the report of the Treasurer for details of its financial condition.

Very respectfully submitted,
On behalf of the Trustees,
T. S. GOLD, *Secretary.*

CALENDAR.

The college year is composed of thirty-six weeks, divided into three terms, of thirteen, twelve, and eleven, respectively.

1894.

The Winter Term began January 1st, and closed March 23d. The Spring Term began April 2d, and closed with the Annual Commencement, June 15th. The Fall Term began September 17th, and closed December 18th.

1895.

The Winter Term began January 2d, and closed March 22d. The Spring Term began April 1st, and closed with the Annual Commencement, June 14th. The Fall Term began September 16th, and closed December 17th.

1896.

Winter Term begins January 6th, and closes March 27th. Spring Term begins April 6th, and closes June 17th. Summer School opens June 29th, and closes August 21st (8 weeks). Fall Term begins September 14th, and closes December 15th.

CATALOGUE OF STUDENTS FOR THE YEAR 1895.

Class of '95.

Francis A. Bartlett,	Simsbury, Hartford Co.
Martin M. Frisbie,	Southington, Hartford Co.
Charles R. Green,	Hartford, Hartford Co.
George R. Hall,	Waterbury, New Haven Co.
William A. R. Hawley,	New Canaan, Fairfield Co.
Arthur J. Pierpont,	Waterbury, New Haven Co.
Arthur E. Shedd,	Preston City, New London Co.
William A. Stocking, Jr.,	Weatogue, Hartford Co.

Fourth Year.

Howard G. Barber,	Union, Tolland Co.
Grace E. Blakeman,	Oronoque, New Haven Co.
Olive N. Clark,	Saybrook, Middlesex Co.
Albert E. Coles,	Rockfall, Middlesex Co.
Clayton T. Curtis,	East Glastonbury, Hartford Co.
John H. Evans,	Thompson, Windham Co.
Ethel E. Freeman,	Spring Hill, Tolland Co.
Grace E. Snow,	Storrs, Tolland Co.
Leroy M. Tucker,	Middletown, Middlesex Co.
Ernest H. Waite,	Middletown, Middlesex Co.

Third Year.

Harry E. Atwood,	Kensington, Hartford Co.
Robert D. Beardsley,	Plymouth, Litchfield Co.
Frederick N. Buell,	Plymouth, Litchfield Co.
Marcus H. Burr,	Redding Ridge, Fairfield Co.
Fred. F. Bushnell.	Winsted, Litchfield Co.
Francis Comber,	Hartford, Hartford Co.
George L. Fish,	Mansfield, Tolland Co.
John N. Fitts,	East Windsor Hill, Hartford Co.
Charles L. Foskett,	Winsted, Litchfield Co.
Charles S. Francis,	Newington, Hartford Co.
Erma L. Fuller,	Mansfield, Tolland Co.

Charles E. Gaylord,	Bristol, Hartford Co.
Albert C. Gilbert,	Gilead, Tolland Co.
Ralph D. Gilbert,	Gilead, Tolland Co.
Arthur O. Green,	Hartford, Hartford Co.
Stancliffe Hale,	So. Glastonbury, Hartford Co.
Clarence B. Hawley,	Hawleyville, Fairfield Co.
Arthur C. James,	No. Windham, Windham Co.
Robert R. James,	Danielson, Windham Co.
Grove H. Johnson,	Winchester Center, Litchfield Co.
Olcott F. King,	So. Windsor, Hartford Co.
Frank E. Lathrop,	Danielson, Windham Co.
S. Frederic Loomis,	Glastonbury, Hartford Co.
Victor E. Lucchini,	Meriden, New Haven Co.
Harry B. Luce,	New Britain, Hartford Co.
Warren T. Ryan,	Thompson, Windham Co.
Fenner Sheldrick,	Hartford, Hartford Co.
William W. Stevens,	New Haven, New Haven Co.
Walter H. Stone,	Cheshire, New Haven Co.
Arthur H. Sturdevant,	Bridgewater, Litchfield Co.
Benj. S. Taylor,	Hartford, Hartford Co.
Edward B. Townsend,	Meriden, New Haven Co.
Albert B. Tyler,	Middlebury, New Haven Co.
William C. Tyler,	Plainville, Hartford Co.

Second Year.

Charles B. Andrus,	Waterbury, New Haven Co.
Frank G. Atwood,	Minortown, Litchfield Co.
Collette A. Baker,	Andover, Tolland Co.
Louis F. Bancroft,	Warehouse Point, Hartford Co.
George M. Barlow,	Westford, Windham Co.
Georgia L. Barnes,	Collinsville, Hartford Co.
Herbert W. Barnes,	Collinsville, Hartford Co.
Wilfred E. Barnes,	Southington, Hartford Co.
Benj. S. Bassett,	No. Haven, New Haven Co.
Albert F. Bidwell,	Canton Centre, Hartford Co.
Philip C. Blakeslee,	No. Haven, New Haven Co.
Arthur D. Bramble,	Willington, Tolland Co.
Palmer Brewer,	Hillstown, Hartford Co,
Asa T. Burdick,	Mt. Hope, Tolland Co.
D. Julian Burgess,	Mansfield, Tolland Co.
Clayton E. Burr,	Higganum, Middlesex Co.
Irving J. Carter,	Meriden, New Haven Co.
Charles P. Case,	Simsbury, Hartford Co.
William J. Casey,	Meriden, New Haven Co.
Charles S. Chapman,	Hartford, Hartford Co.

Herbert T. Clark,	So. Glastonbury, Hartford Co.
Susie A. Colburn,	Willimantic, Windham Co.
Henry L. Coe,	Middlefield, Middlesex Co.
Henry S. Coe,	Waterbury, New Haven Co.
John B. Converse,	Grosvenor Dale, Windham Co.
Fred. A. Cooley,	Granby, Hartford Co.
Frank R. Cramer,	Plainville, Hartford Co.
Grace L. Dawley,	Plainfield, Windham Co.
Robert J. Dickinson,	Westville, New Haven Co.
Sherman W. Eddy,	Simsbury, Hartford Co.
Frank W. Edwards,	Weatogue, Hartford Co.
Mattie J. Farrell,	Storrs, Tolland Co.
Louis E. Fauntleroy,	Norwalk, Fairfield Co.
Harry L. Garrigus,	Waterbury, New Haven Co.
Eugene A. Giddings,	Hartford, Hartford Co.
Walter S. Gillette,	No. Haven, New Haven Co.
Willis N. Hawley,	Hawleyville, Fairfield Co.
George A. Hunn,	Hartford, Hartford Co.
Lottie Hutchinson,	So. Coventry, Tolland Co.
Everell James,	Danielson, Windham Co.
John M. Jewett,	Granby, Hartford Co.
Walter H. Johnson,	New Haven, New Haven Co
Charles E. Keeney,	Coventry, Tolland Co.
Herbert Kirkpatrick,	Cromwell, Middlesex Co.
Lucius M. Knight,	Chaplin, Windham Co.
William E. Little,	Chestnut Hill, Tolland Co.
Edwin S. Mansfield,	No. Haven, New Haven Co.
Irving H. Mansfield,	No. Haven, New Haven Co.
Jerry Meaher,	Vinton's Mills, Hartford Co.
Hermon T. Onthrup,	Middletown, Middlesex Co.
Fred. B. Plumb,	Litchfield, Litchfield Co.
Jasper W. Porter,	Hebron, Tolland Co.
Roger F. Porter,	Hebron, Tolland Co.
Clarence J. Reed,	Hartford, Hartford Co.
Abbie Rosebrooks,	Mansfield, Tolland Co.
George L. Rosebrooks, Jr.,	Storrs, Tolland Co.
Max Schaffrath,	Waterbury, Middlesex Co.
Clinton G. Smith,	Litchfield, Litchfield Co.
George E. Smith,	No. Haven, New Haven Co.
Augusta Terry,	Brooklyn, Windham Co.
Harry O. Tucker,	New Hartford, Litchfield Co.
Myron E. Waters,	Milford, New Haven Co.
Norman J. Webb,	Plymouth, Litchfield Co.
Willie J. Williamson,	Stratford, New Haven Co.
Charles E. Wood,	Middletown, Middlesex Co.

FIRST YEAR.

Fred. R. Ames,	Rockfall, Middlesex Co.
William B. Atwood,	Plymouth, Litchfield Co.
Willie S. Bates,	Grosvenor Dale, Windham Co.
Paul T. Beaumont,	So. Glastonbury, Hartford Co.
Maud M. Booth,	Tolland, Tolland Co.
Millie Booth,	Tolland, Tolland Co.
George B. Brockett,	Avon, Hartford Co.
Emerson L. Brooks,	Brooksvale, New Haven Co.
Frank R. Ely,	Lebanon, New London Co.
Loretta N. Farrell,	Storrs, Tolland Co.
Maud L. Fuller,	Mansfield, Tolland Co.
Minnie Fuller,	Mansfield, Tolland Co.
William R. Geddis,	No. Colebrook, Litchfield Co.
Arthur F. Green,	Mansfield, Tolland Co.
Mabel F. Hall,	Meriden. New Haven Co.
Charles F. Lillibridge,	Norwich, New London Co.
Horace B. Munigle,	Simsbury, Hartford Co.
Guy R. Phelps,	Simsbury, Hartford Co.
Clifford H. Robinson,	No. Haven, New Haven Co.
Burritt M. Terrell,	Colebrook, Litchfield Co.
Ernest M. Vaill.	Litchfield, Litchfield Co.

SUMMARY.

Class of 1895,	8
Fourth-year class,	10
Third " "	34
Second " "	65
First " "	21
Total.	138

Storrs Agricultural College, Nov. 30, 1895.

To the Board of Trustees:

Gentlemen:—I have the honor herewith to transmit to your Honorable Body the fifteenth annual report of the Storrs Agricultural College.

Respectfully your obedient servant,
B. F. KOONS,
President.

Again it becomes our privilege to record the events of the year of college work, which closes with to-day.

We began the year with much crowded quarters, and a strong hope that the General Assembly of 1895 would give us complete relief, but here our wants were to be met only in part.

During the last year we were visited by two epidemics. In December, 1894, just after our last annual report was made, a mild type of scarlet fever appeared among the students. The Board of Health quarantined the college for a time, and some ten or twelve students contracted the disease with no fatal and at no time even serious results. By isolation and the greatest care possible under our conditions, the trouble soon disappeared. Then in March one of the young men fell ill with small-pox and we were again quarantined for some weeks, but by isolation and thorough hygienic measures, the malady was confined to this one case. These two epidemics in a single year emphasizes the need of a cheap and comfortable hospital building. The Board of Health urge this upon us, where isolation may be more complete, and the chances of stamping out a contagious disease much more sure.

These troubles were not owing to the unhygienic condition of our buildings and surroundings, for these are as perfect as can be made, and after thorough inspection by the Board of Health, were pronounced beyond suspicion. Our water supply is absolutely pure beyond a doubt, hence the trouble came without the fault of anyone or anything, and, under ordinary conditions, could not have been prevented nor guarded against.

College work was not stopped, even for a single hour, while these diseases were among us, yet, most naturally, all were under a suspense that detracted to some extent from the efficiency of the work.

Gradual improvement has been made in the different departments of college work; our grounds and approaches have been much improved, new walks laid, etc., and yet greatly needed changes and additions to our facilities for instruction and equipment, urge themselves upon us at every turn.

In June, Mr. C. A. Davis of the Mechanical department, and Miss Short of the Domestic Science department, handed in their resignations, to take effect at the end of the college year, and during the summer vacation Mr. H. S. Patterson and Miss H. L. Smith were elected to fill the respective places.

REPORT OF PROFESSOR PEEBLES.

To the Board of Trustees of Storrs Agricultural College:

Sirs:—The report of the Department of Chemistry and Physics for the past year must be essentially a repetition of that of former years.

We have pursued the usual course in elementary chemistry, and qualitative analysis by members of the second year.

A short course in volumetric analysis, followed by two terms of agricultural chemistry, by the third-year class

One term of quantitative analysis, examination of fertilizers, soils, &c., by the senior class, followed by a course of lectures on organic chemistry.

In the Department of Physics we have seen the most improvement. Facilities for laboratory work, in the recently furnished upper story of the chemical laboratory, have given a practical turn to this subject, making it more interesting as well as distinctly practical.

One term in the third year we devote to the study of a text book of the University Extension series. Very briefly we consider the philosophy of science, descriptive astronomy, and meteorology, each one of which might be profitably expanded into a term's study, if time permitted.

In mathematics, the year includes one term of two lessons a week in geometry, one term surveying, followed by a term of field work.

We rejoice in the better equipment for this study. We are now provided with instruments for all ordinary work that our students are likely to be called upon to do. We have something like a half-term in trigonometry. This comprises all the work in mathematics, except one term in the second year in algebra. It is impressed upon us each year, with increasing force, that larger provision should be made for more work in this important department.

Instruction in vocal music continues through one term, one hour a week.

An orchestra of fifteen members has been organized among the students, which furnished acceptable music on several occasions, and contributed something to the enjoyment of Commencement Day.

Respectfully submitted,
A. B. PEEBLES.

REPORT OF PROFESSOR PHELPS.

To the Trustees of Storrs Agricultural College:

GENTLEMEN:—During the past year an arrangement was perfected which made possible a greater amount of instruction in my department than ever before. The instruction given has been as follows: The fourth-year class, for the winter term, took up a study of Armsby's Cattle-feeding; during the spring term they were given a course of lectures on fertilizers, together with a study of manures from Storer's Agriculture; and for the fall term made a study of the subject of Stock-breeding. Some practical work in judging and scoring live stock has been given and valuable herds have been visited for study.

During the summer term a limited amount of time was given to the study of grasses and forage plants. These were studied by analysis, each student being required to determine the species of at least ten of the grasses. The plants were also studied by observing their characteristics and development during the period of growth.

The third-year class were given, during the winter term, a course of lectures in "Dairying." In addition to this instruction, they had laboratory practice with the Babcock milk test. In turn, for periods of two weeks, the students were placed in charge of the dairy and thus had practical instruction in the care of milk and cream and in the making of butter. In the spring term a study of soils, their physical and chemical properties, and their management, was taken up from Storer's Agriculture. During the fall term a course of lectures was given on "The Management of the Dairy Herd, and Breeds of Live Stock."

The second-year class made a study of soils, drainage, and tillage, for the winter term. This study of soils treats more especially of their classification and formation, and is designed as preparatory to the more advanced study of the subject in the following year. This was followed, during the spring term, by the study of farm-crops, their uses, and their cultivation. A six weeks' course of lectures on the "History of Agriculture" was given during the fall term, followed by a brief course of lectures on "Farm Economy."

One of the most urgent needs of the college to-day is, better facilities for instruction in the practical management of the dairy herd and in practical dairying. I can not refrain from again urging the importance of stocking the farm with good representatives of our leading dairy breeds. Such animals would prove valuable object lessons to our students and to the farmers of the State. Our facilities for giving instruction in practical dairying are at present entirely inadequate to the demands. The room given by the experiment station for the use of the Dairy Department is too small. We need a new building, well equipped with all of the modern dairy appliances. There is an increasing demand for first-class butter-makers and creamery managers in this State, and this institution should place itself in position to fill this demand.

Respectfully submitted,

C. S. PHELPS,

Department of Agriculture.

REPORT OF PROFESSOR GULLEY.

To the Trustees of Storrs Agricultural College:

GENTLEMEN :—The labors of my first year at Storrs College have been very pleasant, and I have reason to think have been very satisfactory to the students, especially the upper classes, judging from the interest they have manifested in the work of this department. The class-work was carried out about as outlined in my last report. The second class put in two hours each week, the whole year, in structural botany and analysis of plants. The third class devoted three hours per week, for the year, to practical horticulture in its various branches. The seniors devoted one term to systematic botany, one to floriculture and landscape gardening ; and the spring term to plant diseases and insect enemies, and the remedies for the same. The latter were prepared and applied by the class to the crops in the field.

The present year's work is being carried on in nearly the same manner, but the increased means of illustration will make it much more valuable to the students.

For the first time, the extra summer term for the third class, was in session during a portion of the summer vacation. Ten of the third class did this summer's work, of which two-fifths of the time was spent in this department. A part of the time was devoted to lectures pertaining to the work of the season ; but by far the greatest portion was spent in the field in examination of crops, study of varieties, and assisting in the handling of crops at that season. Aside from the work in the nursery, the work had to be limited mostly to growth of vegetables, as but few fruit or ornamental trees of sufficient age are at hand to illustrate much in those directions. With the present arrangement of college terms, this part of the course will soon become the most important portion of it.

It gives me much pleasure to report that much progress has been made during the year in equipping the department with what will soon become valuable means of illustration. Quite extensive planting of fruit and ornamental trees has been done. Of fruits, there were set in orchard: of apples one hundred and forty trees embracing sixty varieties, fifty pears of twenty varieties, ninety plums of forty varieties, forty cherry trees of twenty varieties, and thirty-five peach of fifteen varieties. A vineyard of one hundred and eighty vines of sixty varieties and several kinds of small fruits were also planted. In addition, quite a stock of ornamental trees and shrubs were planted in nursery row to supply the grounds when needed. A little permanent planting was done about the buildings, but only a little, as at that time but few of the walks or drives were permanently located. During the latter part of the year several have been established, and the coming season much can be done to beautify the grounds. As part of the educational work, the students made nearly three thousand root grafts of apples, and grew and budded nearly two thousand five hundred stocks of other kinds of fruits. From these the department has to-day about two thousand fine one-year apple trees and two thousand dormant budded trees of pear, plum, cherry and peach. A large share are new or rare varieties, which will be distributed when of suitable age. As each student, particularly those of the third class, has many opportunities to observe the management and growth of the plants, the process becomes familiar to him.

The opening of a new entrance and road along the lake, by the superintendent of the farm, gave an opportunity to permanently establish two drives upon the grounds. These have been laid out and graded. Others not needed have been taken up and the space laid down in grass. Portions of the grounds, around the buildings, have also been graded, and seeded or sodded. All of which has added to the beauty of the campus. These changes were made almost wholly with student labor. At the very close of the season an additional improvement was authorized by your Honorable Body: the laying of concrete walks to connect the buildings. Nearly two hundred yards in length, from one to two yards wide, were laid by a contractor for that kind of work. It is hardly necessary to say that the walks are fully appreciated by those who are continually upon the grounds.

It having been decided to undertake the draining of the twenty acres of swamp land in rear of the farm buildings, the work was placed in charge of this department. It was deemed best to take two years to complete the job. Tile was purchased for the main drain, also for the laterals for the west half of the lot. Work was begun early in July, and by September first, so much of the draining as was undertaken was completed. About sixty-five rods of eight-inch, thirty-five rods of five-inch, sixty rods of four-inch, and two hundred and forty rods of three-inch tile were laid at various depths, from three to four and a half feet. The very severe tests to which the drains have been subjected since they were laid proves the grade and capacity of them to be satisfactory. The work completed represents nearly or quite two-thirds of the whole expense of draining the swamp; as the remaining half to be drained requires no large or expensive mains. The whole when completed and the land subdued, will be the most valuable on the farm for some of the work of this department. A large share of the draining was done by students employed during the summer vacation, and by the summer class. Each of the latter (except female students) laid out, graded and laid at least one drain, some of them several.

At the beginning of the present college year, authority was given to re-pipe and purchase a new heater for the greenhouse. The old boiler proved to be unfitted for the purpose, and very wasteful in use of coal. After examining several boilers of different make, a Palace-King, No. 290, a hot water heater, made by Russell Wheeler & Sons, Utica, N. Y., was ordered. The house has been re-piped and divided into two parts and is now heated by the new boiler. While the weather has not been such as to fully test the merits of the boiler since its use, it so far substantiates all claims made for it, as to capacity, ease of care and economy as to use of fuel. The department is not now ashamed to show the plant to visitors.

The season having been a favorable one for crops, most of the vegetables grown did well. From them, exhibits were made at fairs at Rockville, Willimantic, Meriden and Danbury. At each, a collection was shown of about one hundred and twenty-five varieties from the farm and garden, embracing the old desirable kinds, as well as many new or rare. No effort was made to display overgrown or large specimens, but fair samples of the crop grown and for the purpose intended. The displays attracted much attention and brought out many inquiries as to the work of the college.

The donations of several liberal neighbors, and also from the Farm School at Hartford, have put in the greenhouse specimens of several curious and valuable plants. I may say this has been the source of all the important part of our stock, as no money has been spent to stock the house aside from a few seeds, bulbs and cuttings. From the plants on hand others have been propagated until enough has been obtained. Now that the temperature can be varied to suit different plants, a small outlay for specimens in other classes would be very desirable. With the present stock a very full variety can be prepared to fill the beds upon the campus the coming season.

In the labors of the year I have received valuable help from Mr. E. H. Wait, a member of the present senior class, who had the greenhouse in charge, and particularly from Mr. Walter F. Schults, now on his second year in the employ of the department. He proved a valuable assistant in the extra labor of draining in the summer, and equally so during the present term in overseeing the grading upon the grounds, while my own time was taken up with class-work and in looking after the new heating of the greenhouse.

Respectfully submitted,

A. G. GULLEY,

Department of Botany and Horticulture.

REPORT OF PROFESSOR WATERMAN.

To the Trustees of Storrs Agricultural College:

GENTLEMEN:—The work of the Veterinary Department for the past year has been as follows:

The fourth-year class received lectures on the diseases which are liable to affect our domestic animals. Under this head we take up each disease separately, first define it, give the causes by which the diseased condition may be brought about, the symptoms or manifestations by which we recognize the disease, also its treatment medicinal, dietetic and hygienic. The same class also receives lectures on the source, appearance, physiological actions and doses of the drugs used in veterinary medicine.

The class also spend two hours a day for two or more weeks in dissecting a horse. In this the muscles, articulations, and internal organs are studied. The dissecting aids materially in fixing in mind that which has already been learned in the lecture room.

The third-year class, after finishing the anatomy of the domestic animals which was commenced in the second year, took up the lectures on diseases and medicine as outlined for the fourth-year class.

The second-year class begin the subject by first studying the anatomy and physiology of our farm animals. This includes a study of the bones, joints, muscles, internal organs and organs of special sense. As far as possible specimens of the various parts are procured to aid them in their study.

The aim of the department is to make the course a thoroughly practical one for the farmer, or for one who intends to become such. Only enough of the scientific part of the science is given to make the work interesting. Part of the time is devoted to the care and management of farm animals. The free clinics furnish the students an opportunity to see some practical work. Each class receives two hours instruction in the class-room each week.

In human physiology, "Brown's Physiology and Hygiene" is used as a text-book. The second-year class devote two hours each week during the fall and winter term to the consideration of this subject. The work in the book is supplemented from time to time by lectures on the more important parts. We endeavor to impress upon the class the evils arising from the use of narcotics, especially alcohol and tobacco.

The endeavor of the Military Department is to give the boys a more manly bearing; by giving them such exercises as tend to straighten them and develop their chests. It also forms the habit of attentiveness and precision.

The work of the year has been very pleasant to me and I trust profitable to those under instruction.

Respectfully submitted,
GEO. A. WATERMAN.

REPORT OF MISS KENWILL.

To the Trustees of Storrs Agricultural College:

Gentlemen:—In my report of last year I spoke of the urgent need of a suitable home for the young women.

We now have the pleasure of looking forward to the certainty of such a home in the near future.

With proper means for instruction in domestic science, I see no reason why that department may not rank with the best in the country and offer to the daughters of the farmers of Connecticut equal opportunity with their brothers for thorough equipment for their future.

Our experience last winter with epidemics and contagious diseases emphasized the need of a suitable infirmary.

We hope to see, at no distant day, a small hospital complete in arrangements and isolated from the other buildings, where quarantine can be strictly maintained when the necessity arises.

The health of the students this fall has been excellent. We trust we may not repeat the experiences of last year which were exceptional.

The boys' dormitories were much improved during the summer, both as to comfort and appearance, by the application of paint and paper. New heaters were placed in all rooms in the old dormitory which now affords quarters quite as desirable as those in the new building.

The study of ethics, introduced last year in the Sophomore class, proved of great interest to both students and instructor. The systematic study of manners and morals, of all the attributes of manliness and the factors of character, the consideration of high ideals and noble lives, can not fail to be other than stimulating to the best impulses.

A boy will be like what he admires.

The classes in sewing follow the plan outlined in last year's report. Each girl devotes six hours a week to the practice of needlework.

As superintendent of the social life and general welfare of the students, I may be permitted to say that I have not known a time when the tone and moralé of the college was better than at present.

Respectfully submitted,
MARGARET KENWILL.

REPORT OF PROFESSOR LEWIS.

To the Trustees of Storrs Agricultural College:

GENTLEMEN:—The work done in the departments of English Literature and Rhetoric, is practically that reported in the *Catalogue* for the last year.

Fourth Year. "Literature." Two hours each week. Beginning with its rise and development in Britain, we aim, to trace the growth and expansion of our literature through the more than twelve centuries, intervening, between Cadmon and Tennyson.

My method is, to give, as occasion requires, brief lectures, indicating the historical setting of the author and his works, so as to associate in the student's mind, the precise movements in politics, science or religion, in which the author finds the keynote of his message. Effort is made to bring the student, face to face, with the authors themselves. In this connection I may say that the readiness with which books called for has been met, is very gratifying to me.

The text-book, "Brooke's Literature," is strictly adhered to. This work, though limited in its details, is a work remarkable in purity and elegance of diction, as well as accurate, unbiased and decisive in its criticism of authors and books. Topics are assigned in contemporary literature.

To each student is assigned the producing of a comprehensive essay of not less than three thousand words. Essay to be handed in on or before March first.

Fourth Year. "Rhetoric." One hour each week. Eight weeks are given to complete the course in rhetoric. (See Waddy's "Rhetoric and Composition," beginning with Paraphrase.)

One hour is allotted each week for *rhetoricals.* Special emphasis is laid upon pronunciation, articulation and expression. Shakespeare's *Julius Cæsar*, *Macbeth ;* Milton's *Comus*, and Tennyson's *In Memoriam*, are read.

Ethics. Two hours each week. At the outset of my undertaking to teach this subject, I felt confronted by the difficult task of having to decide upon a text-book suited to the already attained proficiency of my students. But good fortune brought to my attention M. Paul Janét's *Eléments de Morale*, translated by Mrs. C. R. Corson.

Janét's position is, "that moral good is founded upon a natural and essential good, and that the domains of the good and of duty are absolutely equivalent." It is, in short, a work which can not fail to stimulate reflection.

Third Year. Two hours each week. Beginning with the "Elements of Composition." (See Waddy's.) Every month the student is required to prepare an essay on a subject of his own choosing.

Rhetoricals. One hour each week. Genung's "Rhetorical Analysis" forms basis of work. Etymology, and accuracy in reading, together with emphasizing salient points in expression, are sought for.

Would that some public benefactor, to the amount of five thousand dollars, for the institution of a library, *memorial*, or otherwise, might loom up over the horizon, is still the expression of our yearning!

Respectfully submitted,

EDWIN J. LEWIS,

Departments of English, Rhetoric and Ethics.

Drawing Class.

REPORT OF PROFESSOR PATTERSON.

To the Trustees of Storrs Agricultural College:

Gentlemen:—Having been connected with this institution but a short portion of the year, the report of progress, in this department, must necessarily be brief.

Your Honorable Board saw fit to place the care of the entire plant of buildings, and their equipments, in the hands of this department. In looking over the premises, many suggestions have arisen. In the first place the care of existing property was presented. Although, in the main, the buildings and appurtenances were in fair repair, their congested occupancy and constant use necessitate innumerable minor repairs, which have been made so far as time and the limited resources of this department would admit. Some exterior painting has been done by the students, under the supervision of this department, and more will be needed when a suitable season for the work shall arrive, and numerous repairs and improvements must await the coming of spring.

The question of properly lighting the present buildings, and those we hope to see added in the near future, is still an urgent and interesting problem. Many plans have been presented which were objectionable on the ground of utility or cost. New inventions are being brought before the public, and it is hoped that at no distant time something will be applied which will do away with the unpleasant and dangerous lighting with kerosene lamps.

There is a fascination about mechanics that appeals to the American youth, and he only needs the opportunity to make progress, and often to develop marked skill.

The first need is a suitable building to be used as an educational workshop, which should be equipped with light power, with which to operate lathes and planers for wood and iron work, saws, etc. There should be, at least, ten portable forges, with necessary tools, so that practical instruction may be given in forging, welding, making bolts, and repairing farm implements, including the sharpening and repointing with steel of picks, bars, etc. There should also be an equipment for, and instruction in, soldering and brazing. There are other lines of practical mechanics that would naturally find a place, if the facilities were available.

It is hoped, that during the winter term, this department will be able to give valuable instruction in mechanical drawing, commencing with easy lines, and advancing in a practical course of descriptive geometry; teaching simple rules for laying out work by the steel square, until the student shall be able to draw plans of any farm buildings required, to make out a bill of materials for the same, with estimates of cost, and take the carpenter's square and lay out every piece of timber used in the construction. Shop-work will also have a place, and the proper use and care of tools will be taught.

It is also proposed to have a class of young ladies in free-hand drawing. It is also proposed to give lectures on origin and development of the arts and sciences, particularly as applied to architecture and general utility, which, it is hoped, will add to the knowledge of and interest in the work.

It is not intended that this department shall, in any way, detract from the serious and important studies in other lines, or from the work in the several departments of agriculture, but that it shall introduce work at a season of the year, when other employment is not available. In this way it will occupy valuable time and effort which might, otherwise, be wasted.

It is sincerely hoped, that the needs of this department, and the advantages to be gained, will be considered by your Honorable Board, of sufficient importance, to warrant a reasonable outlay.

Respectfully submitted,
H. S. PATTERSON,
Department of Mechanics.

REPORT OF MISS SMITH.

To the Board of Trustees of Storrs Agricultural College:

GENTLEMEN:—The work in Domestic Science covers four years. The sewing done by all the classes will be reported by Miss Kenwill, who has charge of that part of the work.

The practical work in domestic economy begins with the fall term of the second year; it includes lectures, recitations, and practice in laundry work, and lectures and recitations in house-work and house-furnishing; the economy of time, the saving of strength and the cultivation of ideas of neatness being some of the aims of this work. It is not intended to teach *house-keeping* alone, but also to foster a spirit of *home-making*, so that whether the young ladies may be in homes of their own or in charge of homes of others, they may minister to the truest happiness and comfort of the family.

During the winter term of the second year the class will take up the study of the nature and purpose of food and will pay some attention to the nutritive values of the different foods—animal and vegetable. In practical cooking, they will each do sufficient service to give them a good foundation for the work of the following year, and will have a special course of sick-room cookery; both lectures on the relation of foods to disease and the practical work of preparing dishes suitable for the invalid and the convalescent.

In the spring term of the second year the course takes up such subjects as marketing, serving, table-setting, waiting, etc.

The third year will furnish a thorough practical course in cooking. An effort will be made to have the class prepare every dish of which a knowledge would be required in a home of moderate means. Nothing elaborate will be attempted, but tasteful serving will always be attended to.

The fourth-year class will, during the fall term, review the work done on foods their second year, and go one step farther and take up the chemistry of foods.

In the laboratory they will have a short course of fancy cooking, paying particular attention to garnishing and to such dishes as are usually prepared only by caterers, thus placing a hitherto expensive class of delicacies within their reach. The work of writing menus for all occasions will also come in this term.

In the spring term the class will take lectures on bacteria as they affect our food and in their vital relation to health and disease; and will also spend a part of the term on sanitation, taking up ventilation, drainage, care of contagious diseases, disinfection, etc.

During the spring term, I have the young ladies of second-year class in hygiene. The instruction will bear the same relation to the care of their bodies that the later study of sanitation will bear to their environment. Through the winter months, when out-of-door exercise is impossible, all will engage in physical culture; in this class such exercises will be given as will tend toward the highest development; an effort will be made to correct false habits and to strengthen whatever may incline toward the æsthetic.

As a part of the practical work in this department each young lady is marked upon the care given her room; so that she has the opportunity to put in practice something she has learned in domestic economy.

Thus the whole scope of the department is to help girls to a nobler womanhood, to so train their hands and minds that they shall be the better fitted to do the work that lies before them, and to develop, first and always, *womanliness.*

Besides my class exercises I oversee the boarding department. Our accommodations here are heavily taxed from the large increase of pupils.

The Domestic Science laboratory is fairly well equipped at present, though we need a modern range, as the one in use is too large and a great consumer of coal. For the accomplishment of the best results, a smaller modern range is absolutely necessary.

Respectfully submitted,
HARRIET LEZLA SMITH,
Department of Domestic Science.

REPORT OF MISS BARBER.

To the Trustees of Storrs Agricultural College:

GENTLEMEN:—The work under my charge has followed, practically, the plan outlined in the last report.

First Year. This class receives three hours' instruction, daily, in English, history, arithmetic, penmanship, and reading.

The history, as mentioned in the last report, is taught topically. I found, during the winter and spring of '95, a great improvement in the ability of the class to recite without aid. Of course some questions, at first, were necessary to bring out the facts in the lesson, but as the students progressed, they depended less and less upon me. In the fall term I laid even more stress upon this independence, so that now, some members of the class can recite the whole lesson without help. I feel that the students, by this method, gain, not only knowledge but ability, in the use of the English language.

The English has consisted of technical grammar and language. The former I have taught without a text-book, giving only the essentials necessary for good composition. Most text-books contain more than can be grasped in the time allotted to this subject. This fall, however, I found that Maxwell's "Introductory Lessons in English" followed my plan very closely, and I have, therefore, introduced it.

The language work has comprised dictation, short stories written from observation, reproductions, letters, advertisements, telegrams, and other business papers.

In arithmetic I have endeavored to give the students work that will prepare them for the practical needs of life. Franklin's Arithmetic is used as a text-book, supplemented by Prince's "Arithmetic by Grades." The latter contains many practical problems.

In the winter of '95 I introduced the vertical system of writing. This produces legible, if not beautiful penmen, and since writing is a means to an end, and not the end itself, it seems wise to economize time and energy by its use.

The reading matter and history reference books are the same as those given in the last report.

Second Year. I have given this class two hours' instruction each week in English, reading and penmanship having occupied part of that time.

The adoption of vertical writing has materially lessened the time needed for that part of the work. The reading matter is the same as that used in the first year. At present we are reading "Sharp Eyes" by Burroughs, which we find very suggestive.

The English work has been of various kinds: correction of grammatical errors, dictation, reproduction of stories or current history topics, business and social forms of composition, imaginative stories suggested by a few catch-words or a picture, but most of all stories of actual experiences by the students themselves—what they have done or seen others do. I feel that the last-named story is the most valuable, since it cultivates a free and easy style of writing.

I have read to the class bits of good description, such as "How Santa Claus Came to Simpson's Bar," by Bret Harte. This has helped the students to give color and vividness to their own stories.

I have found oral stories, requiring two or three minutes each, to be also valuable. Grammatical errors and inaccuracy of statement are here quite noticeable, and freely criticized.

Milne's "High School Algebra" has been adopted as textbook. The explanations are clear and topics well arranged.

Third Year. This class has received two hours' instruction in book-keeping each week during the fall term. During this time the students have done practical work in double-entry, keeping a full set of books besides writing business papers.

Respectfully submitted,

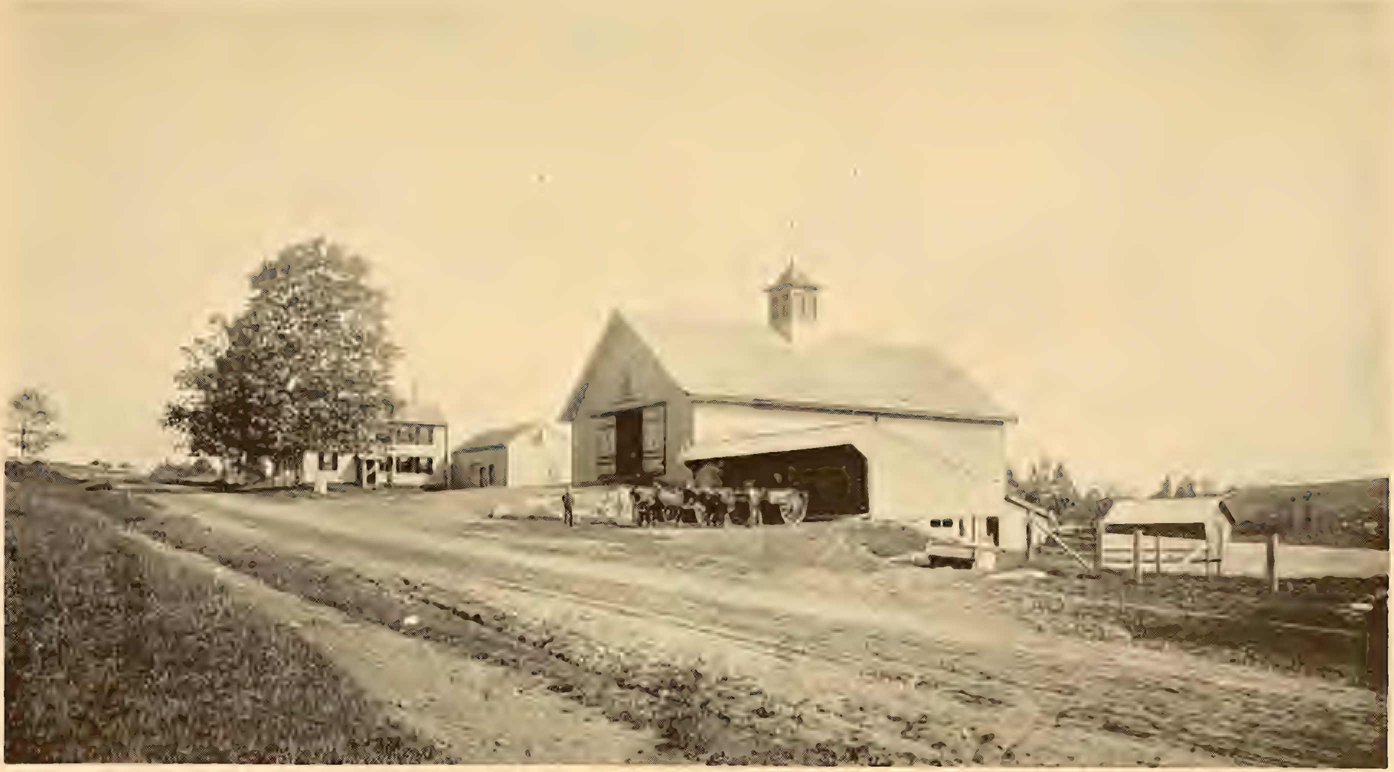
L. J. BARBER.

REPORT OF PROFESSOR CHAMBERLAIN.

To the Hon. Board of Trustees:

It is again my pleasure as well as my duty at the close of another year of service, to report to you something of the present condition of the farm, and by what methods the results given in the accompanying tables have been obtained. The growing needs of the college along lines of scientific work, practical and experimental, have already reduced the farm area by many acres, including the most arable and productive lands. While this is needful, and directly in the interest of agricultural education, it requires some extra outlay of labor and material in order to maintain the aggregate of production of former years, and some radical changes in the means employed.

In our New England agriculture the maintenance of the dairy has become the foremost interest of the farm. Grass once so easily grown as to rank among the most profitable of all our farm products, is annually becoming more difficult of produc-



FARM HOUSE AND BARN.

tion, and so proportionately less economical as a staple food for our dairy animals. The native grasses now require conditions, which our depleted soils and annual drouths deny to them, and make their production almost a problem. This suggests the advantage of substituting the annual grasses, and almost compels their cultivation. During the past season several acres have been utilized in this way and the result has shown that our hay crop may thus be grown at a less cost per ton than upon our best permanent meadows.

A problem equally difficult confronts us in our treatment of pasture lands. These two have become unproductive from the same causes. Everywhere large areas have been abandoned to such growths as nature chooses to lead in her process of restoration to their old-time fertility and productiveness. Here and there small tracts are annually mowed to exterminate these foul growths, but the tussle annually ends in failure.

All pasture lands that are fairly capable of cultivation may be reclaimed with the plow far more readily than with the scythe, and their cultivation removed from the impossible to the profitable side of farm improvement. Considerable work of this kind has been done upon the land to the west of the college buildings. Several acres have been reclaimed and fertilized for cultivation during the coming season. Most of the work of blasting has been performed by the students. All the rocks have been located conveniently for future use.

Quite an amount of labor has been expended in hauling the year's supply of coal, which is all safely stored in or near the various buildings. Some stone wall has been built, of the style commended in my last report, and much more is needed along the division lines of the farm.

The dairy now consists of fifteen cows, most of which are grades of a number of breeds, which were reared on the farm. This is by no means the full measure of the capacity of the farm to furnish the college with the necessary dairy products of milk and butter, while it is the largest number ever reported. It is my hope that something may be done towards testing the different breeds, in similar conditions, as blood has now become the leading factor in all successful dairying.

About ten acres of the swamp land lying near the farm buildings have been thoroughly drained. This work has been supervised by Professor Gulley, whose experience and accuracy is a sure guaranty of its success. A section of this land has also been plowed, and will be put under thorough cultivation the coming season, when it is hoped the entire area may be subjugated. The economy of draining our swamp lands is apt to be overestimated. They require as frequent and generous fertilization, as do our ordinary uplands, and in times of severe drouth, if deeply drained, often suffer to a greater extent. Their ease of cultivation is, however, a very essential condition of profit and pleasure.

Many items of interest must necessarily be omitted from this report, but your familiarity with the farm, and its past as well as its present condition, makes their omission unimportant. I will mention only a single one of these : the establishment of an orchard of three and a half acres, including a full line of fruits, in great variety, and the planting of a vineyard. This anticipates a permanent and urgent need, and gives the sign of a large development of the Horticultural Department.

L. P. CHAMBERLAIN,
Farm Superintendent.

COURSE OF INSTRUCTION.

The first year (see Schedule of Studies) is provided for those who have not mastered the common school branches. Those who are able to pass an examination in the work of the first year, begin with the second year, and can have the choice of a short or long course,—the short, covering the work of the second and third years, in which the elements of the subjects are taught, while the long course includes all of the short, and, at present, one year in addition, the fourth of the schedule.

The short course is to meet the wants of those who have not the time to study longer, yet who desire the elements of an education.

The longer course is to accommodate those who have the ambition to go further, and who desire to do a higher grade of work, and thus secure a more complete education. In the near future it is planned to expand this long course into four years, and allow considerable choice of work, at least in the last year of the course, so that those who desire to make a specialty of any subject, such as horticulture, agriculture, veterinary science, domestic science, or chemistry, for example, may give their time almost exclusively to their chosen work, at least during the last year.

Those who take the short course receive a certificate at its close, the same as from the school in past years, but those who take the long course graduate with a degree.

SCHEDULE OF STUDIES.

First Year.

For those who have not mastered the common school branches, Arithmetic, Grammar, United States History, Penmanship, etc.

Those who can pass an examination upon the above, begin with the

Second Year.

Chemistry, Agriculture, Horticulture, Botany, Human Physiology, Algebra, English, Domestic Science, Veterinary Science, Mechanical Drawing, Wood Shop, Military Drill, Physical Culture, etc.

In each year, while the young men are engaged upon purely agricultural science, military drill, etc., or those branches more properly belonging to man's work, the young ladies take their domestic science studies, such as cooking, sewing, home sanitation, physical culture, etc.

Third Year.

Horticulture, Agriculture, Organic and Agricultural Chemistry, Veterinary Science, Domestic Science, Wood and Iron Shops, English, Civil Government, Book-keeping, Physics, Geometry, Surveying, Botany, Ethics, Mechanical Drawing, Military Drill.

Fourth Year.

Horticulture, Agriculture, Chemistry, Veterinary Science, Domestic Science, Wood and Iron Shop Work continued ; also Meteorology, Rhetoric, Zöology, Political Economy, English Literature, Landscape Gardening, etc.

List of Text-Books Used.

Johnson's How Crops Grow.
Armsby's Cattle Feeding.
Miles' Stock Breeding.
Avery's Inorganic Chemistry.
Remsen's Organic Chemistry.
Kedzie's Qualitative Chemistry.
Quantitative Chemistry.
Brown's Physiology and Hygiene.
Gray's Lessons and Manual of Botany.
Thomas' American Fruit Culturist.
Dana's Text-Book of Geology.
King's The Soil.
Kiddle's Ganot's Physics.
Laughlin's Political Economy.
Milne's Algebra.
Wentworth's Geometry.
Wentworth's Trigonometry.
Wentworth's Surveying.
Maxwell's English Grammar.
Henderson's Gardening for Profit.
Selections from Standard English Authors.
Montgomery's United States History.
Everett's Ethics.
Hunt and Morrow's Soils and Crops.
Bryant and Stratton's Book-keeping.
Veasie's School Singer.
Waddy's Composition and Rhetoric.
Brooker's English Literature.
Mrs. Lincoln's Boston Cook Book.
Church's Food.
Franklin's and Prince's Arithmetics.
Storer's Agriculture.
Janét's Elements of Morals.
Martin's Civil Government.

Text-books are purchased at wholesale rates, and supplied to the pupils at cost.

Conditions of Admission and Expenses.

Candidates must be fifteen years old, and each, by virtue of his entering the college, pledges himself to a faithful discharge of all duties, and a demeanor at all times such as becomes a gentleman.

Tuition is $25.00 per year. $10.00 payable in advance at the beginning of each, the fall and winter term, and $5.00 at the beginning of the spring term.

A deposit of $40.00 also at the beginning of each term will be required, to meet expenses for board, books, etc., or a guarantee of payment, signed by parent or guardian, with satisfactory surety.

Blank guarantees will be furnished on application.

No one will be regarded as a pupil in the institution, or have his name entered upon the class-rolls, until he presents his receipt to the teachers certifying that his accounts are settled at the office.

Text-books, table board, washing, fuel, etc., are furnished at cost. During the past year table board has averaged $2.27 per week. The whole expense per year, exclusive of tuition, and including board, books, fuel, lights, washing, etc., averages $120 to $125, and opportunities are afforded industrious pupils to earn from $25 to $75 a year.

The State furnishes rooms supplied with table, chairs, bedstead, mattress and wash-stand, free of rent, and the occupant is held responsible for the proper care of them. Students must supply their own pillows, bedding and bed linen, towels, lamps, napkins for the table, etc. Each should have his property distinctly and indelibly marked with his own name, so as to avoid confusion and loss in the laundry and elsewhere.

Owing to our limited dormitory accommodations, two students must occupy the same room.

A student's surroundings have much to do with his comfort, his success in his studies, and even his self-respect, hence it is urged that each supply his room with carpet, or at least rugs or mats, and whatever else will make it attractive and home-like.

Good clothing, such as is necessary for comfort at home, is all that is needed, and for farm work, any sort of substantial wear-

Rear View with Lake.

ing apparel, no matter if it is patched. The students dress to suit the character of their work. A pair of rubber overshoes, a pair of rubber boots, and a rubber coat, are very desirable articles in a young man's outfit.

The military uniform is not obligatory, yet two-thirds or three-fourths of the young men secure it ; a very good suit of gray, made to order at a cost of about $13.00 for coat, pants and cap ; perhaps as cheap as a suit of equal quality can be purchased anywhere.

Location.

The railroad station is Eagleville, seven miles north of Willimantic, on the New London Northern (Central Vermont) road, and is reached from Hartford by the New England, and from New Haven by the Air Line to Willimantic, where the road intersects these lines.

Commencement Exercises, Friday, June 14th, 1895.

PROGRAMME.

10.30 A. M.

Music—See, the Conquering Hero Comes, *Hartman.*
College Orchestra.

Prayer.

Music—Reign of Cupid, *Rollinson.*
College Orchestra.

College Course.

F. A. Bartlett, Simsbury.
Agricultural Colleges—Do they Aid the Farmer?

M. M. Frisbie, Southington.
The Monroe Doctrine.

Music—March Polonaise, *Rollinson.*
Orchestra.

C. R. Green, Hartford.
An Exposition of Vivisection.

G. R. Hall, Waterbury.
Ornamental Gardening for New England.

Music—Mosaic Overture, *Rollinson.*
Orchestra.

W. A. R. Hawley, New Canaan.
The Influence of Literature upon the Nation.

A. J. PIERPONT, Waterbury.
Division of Labor.

Music—Whirligig Galop, *Rollinson.*
Orchestra.

A. E. SHEDD, Preston City.
The Germ Theory of Disease.

W. A. STOCKING, JR., Weatogue.
The College Man in Society.

Music—On Guard March, *Rollinson.*
Orchestra.

SHORT COURSE.
Excused from Reading.

H. G. BARBER, Union.
Price of Success.

C. S. FRANCIS, Newington.
Forestry.

A. C. JAMES, North Windham.
Sheep Industry in New England.

A. H. STURDEVANT, Bridgewater.
The Influence of Forests.

L. M. TUCKER, Middletown.
Use of Fertilizers.

A. B. TYLER, Middlebury.
Education.

AFTERNOON EXERCISES.
1 o'clock.
On Parade Ground.
Exhibition Drill of the Military Department.

1.45 o'clock.
In the Chapel.

Music—American Medley, *Bendix.*
Orchestra.

Address—N. J. BACHELDER, Secretary New Hampshire Board of Agriculture.

Music, *C. L. Waite.*
Cornet Solo.

AWARDING OF PRIZES.

CONFERRING OF DIPLOMAS.

Music—Love's Dreamland Waltz, *Rœder.*
Orchestra.

PRIZES.

Considerable interest at commencement time is centered in the contest for the Ratcliffe Hicks prize of $50.00, made permanent by Mr. Hicks by making over to the College Treasurer interest-bearing guaranteed bonds, the income of which is to be used as an annual prize for excellence in English composition, to the two members of the graduating class who prepare the best essays upon some assigned subject.

This year the subject was: "The Application of Science to Our Daily Lives."

A. J. Pierpont won the first prize of $30.00, and M. M. Frisbie the second of $20.00.

Also, the Alumni of the College have established two prizes, aggregating $15.00, for excellence in practical farm and garden work. The contestants were taken to the fields and gardens, the various implements put into their hands for actual use, such as a scythe, hoe, rake, cultivator, plow, etc., etc.

Mr. W. A. Stocking, Jr., won the first prize of $10.00, and M. M. Frisbie the second of $5.00.

PUBLIC LECTURES.

The usual winter course of popular lectures was somewhat broken up by quarantines, but the following subjects were presented. These are free to the students and the people of the community who choose to avail themselves of the instruction and entertainment afforded.

Miss M. Kenwill,	"Hawaii," Illustrated.
Hon. W. E. Simonds, Ex-Com. of Patents,	"Man the Creator: the Development of Inventions," Illustrated.
Dr. Mary Wood Allen.	
First Lecture,	"The Man and Woman of the Twentieth Century."
Second Lecture,	"Social Purity."

A general meeting on Washington's Birthday.
Faculty and students participate in a patriotic or "Citizenship" programme.

Memorial Service on Decoration Day.

Rev. J. H. James	"The Problem of the Age."

PUBLIC WORSHIP.

Students are expected to attend college chapel daily, and church services Sunday morning. Parents or guardians may designate what church they desire their wards to attend, otherwise seats are provided in the church near the college.

LIBRARY.

There is no question as to the desirability of a properly equipped library for the Storrs Agricultural College. It is a necessity.

The year past has seen the largest growth in its library of any one year in the history of the institution. There have been added one hundred and twenty-eight (128) volumes by purchase, nine (9) volumes by gift, besides about twenty-five (25) volumes of agricultural reports and Government publications, besides about three hundred (300) pamphlets and station bulletins, making a total now accessible to our students as follows :

Pamphlets,	2,000
Bound volumes,	1,943
Total,	3,943

To bring up this important adjunct of our work, as an educational institution, a still larger liberality should be extended it in the year to come.

ENTRANCE EXAMINATIONS.

That future candidates for admission may know about what ground is covered in the entrance examination, we give the list used in 1895.

Heretofore but one set of questions has been used ; and those passing with a grade of 60% were admitted to the second year ; those not coming up to this standard were required to spend a year upon the common school branches.

Next year it is proposed to raise the standard for entrance to the second year, and also present an entirely different set of questions for those desiring admission to the first year.

LIST OF EXAMINATION QUESTIONS.

GENERAL.

1. Write your name plainly, and in full, with post-office address.
2. Write the name of your parent or guardian, with post-office address.
3. Give your age, and where born, where you attended school last, and what your employment has been during the last year.

ARITHMETIC.

1. If $25\frac{1}{2}$ tons of coal cost $216.75, how much will $9\frac{1}{2}$ tons cost?
2. Bought 67.75 acres land at $62.50 an acre, and sold the lot for $5,081.25. Was there a gain or loss? How much on the whole, and how much an acre?
3. Reduce $\frac{1}{2}$, $\frac{2}{5}$, $\frac{3}{8}$, $\frac{13}{16}$, $\frac{7}{64}$, $\frac{7}{25}$, $\frac{17}{50}$, to decimals, and .225, .075, .815, and .0085 to common fractions.
4. If nine grain bins contain 143 bush., 2 pks., 2 qts., 1 pt. of grain, what does one bin contain?
5. What per cent. of anything is $\frac{2}{5}$ of it? $\frac{3}{4}$ of it? $\frac{2}{3}$ of it?
6. If I sell a horse for $175, and gain 5 per cent., what would be my gain per cent. if I had sold him for $200?
7. What is the interest on $67.43 from Nov. 25, 1878, to Mar. 7, 1879, at 5 per cent.?
8. What is the amount at compound interest of $300 for 2 years, 8 months, at 4 per cent.?
9. How many feet, board measure, in 55 sticks of timber, 3 x 4 inches by 16 feet long?
10. What is the distance on the floor from one corner to the opposite corner of a rectangular room, 16 by 24 feet.

ENGLISH.

1. Spelling (words to be pronounced).
2. Reproduction (to be read).
3. Write a short friendly letter.
4. Write a sentence, using quotation marks.
5. Write an interrogative sentence.
6. (Simple declarative sentence), analyze and parse.
7. Complex sentence.
8. Compare the following adjectives: good, high, beautiful.
9. Write the possessive, singular and plural of man, I, hand, tree, hero, knife, sheep.
10. Correct the following sentences, and give reasons for corrections:

    Who did you see?
    Was you there?
    The man's manners is bad.
    It is me.
    The bird sets on the tree.
    For who did you go?

GEOGRAPHY.

1. Bound Connecticut, Maine, and Massachusetts.

2. How many States are there in the Union?

3. How do the climate, products and people of New England differ from those of the Gulf States?

4. What route would you take in going from New York to Japan?

5. What route from San Francisco to London?

6. What are the principal industries of Connecticut? For what are some of its chief cities noted?

7. What are the chief products of Pennsylvania?

8. Name five of the principal rivers of the United States, and the waters into which they empty.

9. What makes New York, Baltimore, Charleston and New Orleans important cities?

10. What are the principal imports of the United States, and from what countries do they come?

HISTORY.

1. What nations planted colonies in North America? Give a brief history of the leading three.

2. Give a brief outline of the settlement of Connecticut?

3. Give the cause and results of the Revolutionary war.

4. Give the causes of and results of the Civil war.

5. What portion of the United States was first settled? What additions of territory have been obtained since?

LABOR OF STUDENTS.

For farm.	$ 622.43
On permanent improvements,	104.40
On greenhouse,	19.02
For horticultural department,	495.37
On college grounds,	14.42
On college buildings,	161.96
Care of college buildings,	75.09
For boarding department,	357.96
In dormitories, care of,	45.92
On ice,	37.80
On fuel,	103.57
In horse barn,	148.01
In wood and iron shop,	5.47
For dairy department,	56.43
For poultry department,	38.35
For college,	58.26
Total,	$2,344.46

For the experiment station,	$ 125.82

ESTIMATED INVENTORY OF GOODS ON HAND.

Chemical apparatus,	$ 315.00
Reagent bottles,	150.00
Chemicals, inorganic,	215.00
Chemicals, organic,	60.00
Physical apparatus, old,	170.00
" " new (1894),	360.00
Surveying instruments,	275.00
Photographic instruments,	105.00
Chemical balances (2),	125.00
	$1,775.00

Furnishing college buildings,	$2,350.00
Natural history,	$ 400.00

Mechanical Department—Wood and Iron shop outfit and supplies,	$ 250.00

Number of books and pamphlets in library, 3,943.

Horticultural Department,	Tools, etc.,	$ 110.00
	Greenhouse plants,	50.02
	Tile on hand,	45.00
		$ 205.00
Domestic Science Department,	Kitchen lab.,	$139.59
	Sewing room,	76.96
		$ 216.55
Kitchen and dining-room outfit,		$ 627.51
Dormitories,		$1,750.00
Military Department,		$ 200.00

Live Stock on Hand December 1, 1895.

1 pair of working oxen,	$ 125.00
1 pair of farm horses,	100.00
2 grade short-horn cows,	65.00
3 grade Holstein cows,	115.00
4 grade Guernsey cows,	160.00
1 grade Swiss cow,	40.00
4 grade Jersey cows,	160.00
2 full-blood Jersey cows,	80.00
6 grade heifers,	150.00
1 full-blood Jersey calf,	10.00
2 veal calves,	12.00
5 fat hogs,	70.00
5 pigs,	20.00
	$ 1,107.00
Horse Barn:	
4 horses,	$ 450.00
Wagons and sleds,	350.00
Harness, blankets, etc.,	90.00
	$ 890.00
Estimated value of farm implements,	$ 720.00

Labor Performed for College.

Cutting and hauling ice,	$ 54.92
Hauling 200 tons of coal,	200.00
Shoveling coal at cellars,	3.00
	$ 257.92

LABOR ON PERMANENT IMPROVEMENTS.

Removing rocks and stones,	$ 163.10
Building stone wall,	41.75
Building wire fence,	14.56
Building road to main building,	108.08
Improving swamp land,	19.46
	$ 346.95

AMOUNT AND VALUE OF FARM AND GARDEN PRODUCTS.

30	tons of English hay,	$ 480.00
15	tons of swamp hay,	105.00
10	tons of Hungarian hay,	170.00
2	tons of oats and peas, dried,	30.00
488	bushels of ears of corn,	146.40
578	bushels of potatoes,	260.10
468	bushels of turnips,	103.60
35	bushels of onions,	17.50
20	bushels of beets,	8.00
40	bushels of carrots,	12.00
40	bushels of parsnips,	14.00
5	bushels of salsify,	5.00
12	bushels of Lima beans,	12.00
400	cabbages,	12.00
500	heads of celery,	15.00
5,000	pounds of squashes,	50.00
57,729	pounds of milk,	1,026.24
4,023	pounds of beef,	243.75
1,145	pounds of veal,	57.25
3,400	pounds of pork,	204.00
1	calf raised,	10.00
1	veal calf,	6.00
2	shoats.	15.00
80	tons of silage,	200.00
		$3,202.84

TREASURER'S REPORT.

H. C. Miles, *Treasurer*,
In account with Storrs Agricultural College.

1894.	Dr.	
Sept. 30.	By balance of account,	$1,994.12
	By cash Comptroller,	5,000.00
Nov. 17.	Mrs. M. H. Parker,	10.00
Dec. 4.	B. F. Koons,	300.00
27.	B. F. Koons,	200.00
1895.		
Jan. 9.	Comptroller,	5,000.00
14.	B. F. Koons,	1,000.00
31.	B. F. Koons,	1,000.00
Feb. 27.	B. F. Koons,	1,000.00
Mar. 11.	Experiment Station,	44.77
April 2.	Comptroller,	5,000.00
July 1.	Comptroller,	5,000.00
9.	B. F. Koons,	200.00
Aug. 2.	Comptroller,	5,000.00
Sept. 30.	Sundries,	247.83
	Ratcliffe Hicks' Prize Fund,	45.00
		$31,041.72

CLASSIFICATION OF EXPENSES FOR YEAR OCT. 1, 1894—SEPT. 30, 1895.

1894–5.	Cr.	
	Books and stationery,	$1,453.51
	Postage,	85.96
	Telephone,	34.35
	College supplies,	198.82
	Chemicals and apparatus,	1,223.65
	Buildings and repairs,	1,922.77
	Shop outfit and supplies,	65.59
	Travelling expenses,	180.81

Veterinary Department,	$ 31.21
Salaries,	12,626.61
Domestic Science Department,	164.62
Provisions,	3,681.13
Servant hire,	1,010.44
Fuel and lights,	339.00
Dormitory outfit,	236.96
Kitchen outfit,	215.49
Washing,	893.25
Church seat rent,	30.00
Horticultural Department, labor,	567.45
fertilizers,	57.20
supplies,	710.26
horticultural stock,	234.58
blacksmith,	8.50
Horse barn supplies,	138.09
feed,	631.50
horse purchased,	80.00
blacksmith,	43.79
Farm supplies,	309.89
labor,	413.67
feed,	506.56
fertilizers,	121.52
stock purchased,	318.73
blacksmith,	49.48
Dairy Department,	113.34
Trustees' expenses,	209.53
Insurance,	198.58
Sundries,	28.93
Total,	$29,135.77
Balance of account,	1,905.95
	$31,041.72

This certifies that we have examined the accounts of Henry C. Miles, Treasurer of the Storrs Agricultural College for the fiscal year ending September 30th, 1895, and compared them with the vouchers, and found the same correct. The balance in the hands of the Treasurer on said date amounted to one thousand nine hundred and five dollars and ninety-five cents ($1,905.95).

MERIDEN, November 26, 1895.

OSCAR LEACH, } *Auditors of*
E. LIVINGSTON WELLS, } *Public Accounts.*

FORTY-FOURTH ANNUAL REPORT

OF THE

BOARD OF TRUSTEES.

OF THE

Connecticut School for Boys,

AT

MERIDEN, CONN.,

For the Fiscal Year ending Sept. 30, 1895.

TO

His Excellency O. VINCENT COFFIN

GOVERNOR OF THE STATE OF CONNECTICUT.

MERIDEN:
PRESS OF THE CONNECTICUT SCHOOL FOR BOYS.
1895.

TRUSTEES

OF THE

CONNECTICUT SCHOOL FOR BOYS.

Hon. JOHN L. HOUSTON,	Thomsonville,	Hartford County.	
Term Expires,			1897.
Hon. JOHN McCARTHY,	Danbury,	Fairfield County.	
Term Expires,			1897.
Hon. W. S. BEECHER,	New Haven,	New Haven County.	
Term Expires,			1899.
Hon. GEORGE O. BALCH,	Ashford,	Windham County.	
Term Expires,			1899.
Hon. GEORGE P. CRANE,	Woodbury,	Litchfield County.	
Term Expires,			1899.
Hon. FRED DEPEYSTER,	Portland,	Middlesex County.	
Term Expires,			1899.
Hon. JOSEPH HUTCHINGS,	Columbia,	Tolland County.	
Term Expires,			1899.
Hon. J. S. LATHROP,	Norwich,	New London County.	
Term Expires.			1899.

RESIDENT TRUSTEES.

Hon. N. L. BRADLEY,	Meriden,	New Haven County.	
Term Expires,			1899.
Hon. C. H. S. DAVIS,	Meriden,	New Haven County.	
Term Expires,			1897.
Hon. JOHN C. BYXBEE,	Meriden,	New Haven County.	
Term Expires,			1897.
Hon. SETH J. HALL,	Meriden,	New Haven County,	
Term Expires,			1897.

OFFICERS OF THE BOARD OF TRUSTEES.

PRESIDENT.

HON. JOHN L. HOUSTON.

SECRETARY AND TREASURER,

HON. C. H. S. DAVIS.

EXECUTIVE COMMITTEE,

HON. N. L. BRADLEY,
HON. JOSEPH HUTCHINS,
HON. GEORGE O. BLACH
HON. JOHN C. BYXBEE.
HON. J. S, LATHROP.

COMMITTEE ON DISCHARGES,

HON. N. L. BRADLEY,
HON. S. J. HALL,
HON. JOHN C. BYXBEE,
HON. FRED LEPEYSTER.
HON. GEO. P. CRANE.
Supt. SAMUEL THATCHER.

COMMITTEE ON EDUCATION,

HON. J. S. LATHROP,
HON. C. H. S. DAVIS.

SANITARY COMMITTEE,

HON. C. H. S. DAVIS, M. D,
HON. N. L. BRADLEY.

MORAL AND RELIGIOUS TRAINING,

HON. GEORGE P. CRANE,
HON. W. S. BEECHER.

INDUSTRIAL TRAINING.

HON. N. L. BRADLEY,
HON. FRED DEPEYSTER,
HON. S. J. HALL
HON. JOHN McCARTHY

OFFICERS OF THE SCHOOL.

SUPERINTENDENT,

REV. SAMUEL THATCHER.

MATRON,

MRS. SAMUEL THATCHER.

BOOK-KEEPER,

ROBERT S. HAYES.

TEACHERS OF CONGREGATE DEPARTMENT,

MRS. J. S. CRABB. MRS. SADIE E. GILE
MRS. M. F. DAYTON.

SUPERVISOR OF SOUTH DIVISION,

THOMAS H. MAGUIRE.

SUPERVISOR OF NORTH DIVISION,

J. S. CRABB.

SUPERVISOR OF PRINTING DEPARTMENT,

REV. GEO. L. COBURN.

SUPERVISOR OF TELEGRAPH DEPARTMENT,

MRS. A. E. BURGESS.

HOSPITAL NURSE,

MRS. A. L. MARSTON.

FARMER,

M. H. MARSTON.

NIGHT WATCHMAN,

PATRICK WHALAN.

COTTAGE A,

SUPERVISOR—JOHN GALLAGHER.
MATRON—MRS. JOHN GALLAGHER.
TEACHER—MISS EMMA GALLAGHER.

COTTAGE B,

SUPERVISOR—J. A. SMITH.
MATRON—MRS. J. A. SMITH.
TEACHER—MISS NETTIE A. BROWN.

COTTAGE C,

SUPERVISOR—JOHN PARISH.
MATRON—MISS MARY I. RAND.
TEACHER—MRS. JOHN H. PARISH.

COTTAGE D,

SUPERVISOR—F. P. OWEN.
MATRON—MRS. F. P. OWEN.
TEACHER—MISS A. OWEN.

COTTAGE E,

SUPERVISOR—C. S. FOX.
MATRON—MRS. C. S. FOX.
TEACHER—MISS JENNIE F. WALSH.

REPORT OF THE TRUSTEES

OF THE

Connecticut School for Boys.

To His Exellency, O. VINCENT COFFIN, *Governor of the State of Connecticut.*

Sir :—The Trustees of the Connecticut School for Boys respectfully herewith present their forty-fourth Annual Report.

The various departments of the School are working harmoniously under the judicious management of Superintendent Thatcher, and, in addition to the industries mentioned in our last report there has been added that of blacksmithing for which a brick shop has been constructed 50 by 24 feet, well appointed for the work. The sanitary condition of the School is good and the moral and religious training of the School, supplemented by the clergymen of the different local churches, is all that could be expected.

In the ordinary branches of education, the boys, under experienced teachers, are making commendable progress and the School compares favorably with the Common Schools of the State.

The Report of the Superintendent will give fuller information of the present state and the working plans for the future.

The following is a summary of the inmates from the establishment of the School in 1851 to Sept. 30, 1895:

Whole number of boys received since 1851,	5,624
Number remaining in the School, Sept. 30th, 1894,	481

Number received between Sept. 30, 1894, and Sept. 30, 1895,	153
Number discharged between Sept. 30, 1894, and Sept. 30, 1895,	258
Number returned on old commitments,	66
Whole number in School, Sept. 30, 1895,	442

J. S. LATHROP,
CHAS. H. S. DAVIS,
N. L. BRADLEY,
WM. S. BEECHER,
GEORGE P. CRANE,
JOHN McCARTHY,
JOHN C. BYXBEE,
SETH J. HALL.

Sworn to before me, FRANK A. STEVENS,
Notary Public.

MERIDEN, CONN., December 24, 1895.

SUPERINTENDENT'S REPORT.

To the Trustees of the Connecticut School for Boys :

GENTLEMAN. In conformity with law, I herewith beg leave to present my Annual Report, to the Hon. Board of Trustees of the Connecticut School for Boys for the year ending Sept. 30th, 1895.

The sanitary condition of the School, has maintained its high standing. We have had very little sickness during the past year, notwithstanding the fact that we have to report five deaths for the fiscal year. But these came to us effected by the disease of which they died. (For more explicit information on this point I refer you to the Physician's report.) This is the more remarkable when we consider that many of our boys come to us predisposed to all manner of diseases, coming as they do, many of them from surroundings tainted with disease, both physically and morally, and the two natures are closely allied to each other.

A weakened and diseased body cannot produce a strong and healthy mind, and it is everywhere apparent that an impure, and immoral mind, a has weakning effect upon the physical nature ; so in order to reform the man, or boy, both natures must be cultivated and built up. With this end in view we have introduced during the past year a system of calisthenics known as the "Setting up System of the regular army."

In addition to this we have organized the boys into military companies with the appointment of petty officers, from among the boys themselves. This is yet in its initiatory state, yet we believe it is a step in the right direction, and we are hoping to have a well equipped gymnasium in the not far distant future.

The classes in trade teaching have been making good progress. During the past year the trades, masonary and brick laying, have been added to the trades already taught in the School. From eight to sixteen boys, with instructor have been constantly employed. As a partial result of their work we have a new blacksmith shop 50 x 24, and one and a half stories high. The boys have shown great adaptablity in acquiring this trade, and as a result, we have a well constructed building. The carpentry for this building has been done by the class in carpentering, and also the general repairs of the Institution, besides making many much needed improvements. We have contemplated introducing the Sloyd system, but our boys with their instructor have been kept so busy with the practical work, that we found no time to do so. We have also introduced a class in wood carving as the boys seem to evince a natural taste for this branch of industry, and our aim will be accomplished not so much in perfecting wood carvers, as creating in the boys a love for the use of tools.

The Printing Office under the instruction of Rev. Geo. L. Coburn is doing efficient work, a number of improvements have been made, and we consider this department better equipped than ever before. Telegraphy, with the home industries such as shoe making and tailoring have been carried on as usual.

The holidays have been duly observed. The regular Thanksgiving dinner, with its necessary fixings, was furnished the boys on that day. On Christmas eve each division had its Christmas tree, and every boy in the Institution was made glad by some token of good will. The Fourth of July was celebrated by grand field sports, in which the boys of the various divisions manifested a great deal of proficiency as well as enthusiasm.

August 14th was a day long to be remembered by the boys when they enjoyed their annual picnic at Hanover Park. We left on the Colony Street line of cars at 9 A. M., and on arrival at the Park, Supt. Griffen presented us with forty dollar's worth of tickets which admitted us to the various amusements of the park. We took our lunch with us, and returned at 5 P. M., all tired but happy. The happy hour series of entertainments, were given once every two weeks during the winter months, also several first class entertainments by outside parties.

In conclusion I wish to express my gratitude to the members of the Board of Trustees for their deep personal interest in the welfare of the School.

All of which is respectfully submitted,

SAMUEL THATCHER, *Supt.*

PHYSICAN'S REPORT.

To the Superintendent of the Connecticut School for Boys.

The health of the inmates of this Institution this past year has been unusually good. The presence of scarlet fever here--luckily confined to three cases--shows the necessity of a place where the patients suffering from contagious diseases can be better isolated. The disease in this instance was undoubtedly contracted from some clothing sent to one of the boys.

During the year there has been three deaths—scarlet fever, one ; valvular disease of heart, one ; meningitis following purulent inflamation of middle ear, one.

From December 1894, to December 1895, the following cases have been under treatment in the hospital.

Abcess,	7
Bilious attacks,	20
Bronchitis,	10
Conjunctivitis,	15
Contusions,	6
Chilblains,	10
Diarrhœa,	14
Dysentery,	3
Epilepsy,	1
Eczema,	12
Erysipelas,	1
Furuncles,	7
“of external auditory canal,	8
Fracture, forearm,	1
“ humerus,	1
Fever, Intermittent,	2
Fever, remittent,	2
Fever, chills and	2
Fever, scarlet,	4
Glands, scroful's	3
Gonorrhœa,	29
Gleet,	3
Hemorrhoids,	12
Influenza,	12
Jaundice,	1
La Grippe,	10
Laryngitis, acute catarrhal,	5
Malaria,	5
Orchitis,	3
Phimosis,	2
Phthisis,	3
Pertussis,	3
Rheumat'm, acute inflamatory,	3
Rheumat'm, muscular,	1
Ringworm,	7
Scabies,	2
Sprains,	7
Tonsillitis,	17
Ulcers,	16
Total,	260

C. H. S. DAVIS, *M. D.*

EXHIBIT No. 1.

CLASSIFIED STATEMENT OF EXPENDITURES AND RECEIPTS OF THE CONNECTICUT SCHOOL FOR BOYS, FROM OCT. 1, 1894, TO SEPT. 30, 1895.

EXPENDITURES.		RECEIPTS.	
Chair Shop, .	$1,266.71	Bal. Oct. 1, 1894,	$1,415.83
Printing Office, .	961.96	Fr. Chair Shop,	3,862.88
Miscellaneous, .	1,077.88	State Treasurer,	71,320.81
Farm, . .	1,606.92	Printing Office,	481.82
Traveling, .	867.37	Boarders, . .	340.50
Library, . .	253.86	Miscellaneous, .	101.67
Postage, . .	74.80	Farm, . .	257.80
Freight, . .	391.07	Freight, . .	169.72
Tel'ph & Telephone, .	132.45	Telephone, . .	1.25
Chapel, . .	100.00	Traveling, . .	.65
Provisions, . .	18,874.64	House Furnishing,	3.03
House Furnishing,	3,177.93	Laundry, . .	1.00
Repairs & Improv'ts,	6,235.71	Clothing, . .	11.87
Laundry, . .	562,03		
Clothing, . .	4,077.83		
Heating and Lights,	7,037.38		
Hospital, . .	364.18		
Stable, . .	2,716.22		
Salaries, . .	23,943.15		
Shoe Shop. . .	994.62		
Returning Escapes,	160.51		
School B'ks & Stat'y,	247.90		
Water Works, .	679.43		
Insurance, .	40.00		
Bal. Oct. 1, 1895	2,125.09		
	$77,968.83.		$77,968.83

MERIDEN, November 25, 1895.

This is to certify that we have examined the accounts of the Superintendent and Treasurer of the Connecticut School for Boys from October 1, 1894, to September 30, 1895, inclu sive and compared them with the vouchers, and find them correct,

The balance in the hands of the Superintendent was one hundred and thirty-seven dollars and seventeen cents $137.17, and the balance in the hands of the Treasurer was one thousand nine hundred and eighty-seven dollars, and nine-two cents, $1,987.92. There is also due the Institution the sum of two thousand, five hundred and seventy-six dollars and thirty-six cents, $2,576.36, for work done by the boys.

OSCAR LEACH, } *Auditors of*
E. LIVINGSTON WELLS, } *Public Accounts.*

EXHIBIT No. 2.

SHOWING THE WHOLE NUMBER OF BOYS THAT HAVE BEEN INMATES OF THE SCHOOL SINCE ITS OPENING IN MARCH, 1854.

Whole number since opening,			5,624
Number in School Oct. 1, 1894,		481	
From Hartford County,	21		
New Haven County,	60		
Fairfield, "	31		
New London, "	6		
Middlesex, "	9		
Tolland, "	1		
Litchfield, "	15		
Windham, "	6		
Boarders,	4		
Number received on old Commitment,	49		
Number returned themselves,	17–219		
Total,	700		
Discharged in various ways,	258		
Number remaining in School Oct. 1, 1895,	442		

EXHIBIT No. 3.

SHOWING THE AGE OF BOYS AT COMMITMENT.

AGE.	PAST YEAR,	PREVIOUSLY	TOTAL.
Six,	1	10	11
Seven,	0	34	34
Eight,	3	79	82
Nine,	6	192	198
Ten,	14	526	540
Eleven,	19	612	631
Twelve,	15	817	832
Thirteen,	23	864	887
Fourteen,	22	968	990
Fifteen,	35	987	1,022
Sixteen,	14	317	331
Seventeen,	1	40	41
Eighteen,		19	19
Nineteen,		5	5
Twenty,		1	1
Total,	153	5,471	5,624

EXHIBIT No. 4.

SHOWING FOR WHAT OFFENSE COMMITTED.

	PAST YEAR.	PREVIOUSLY.	TOTAL.
Theft,	42	2298	2340
Burglary,	2	271	273
Vagrancy,	12	354	366
Truancy,	15	717	732
Stubborness,	0	51	51
Obtaining goods under false pretence,	0	22	22
Arson,	1	39	40
Cruelty to Animals,	0	6	6
Sabbath Breaking,	0	1	1
Malicious Mischief,	2	71	73
Assault and Battery,	2	61	63
Breach of Peace,	2	61	63
Horse Stealing,	0	17	17
Disorderly Conduct,	0	13	13
Robbery,	0	7	7
Trespass,	0	19	19
Manslaughter,	0	1	1
Forgers,	0	7	7
Driving horses without permission,	0	40	40
Lacivious Carriage,	0	4	4
Profane Cursing,	0	4	4
Getting on Cars,	0	3	3
Abusive Language,	0	3	3
Common Drunkard,	0	14	14
Misdemeanor,	1	10	11
Fornication,	0	1	1
Breaking Windows,	0	10	10
Attempt to Kill,	0	1	1
Attempt to Commit Rape,	0	10	10
Rape,	0	4	4
Disobedience,	0	21	21
Placing Obstructions on Railroads,	2	6	8
Receiving Stolen Goods,	0	1	1
Intoxication,	0	20	20
Boarders,	4	177	181
Incorrigibility,	66	985	1051
Assault,	2	141	143
Total.	153	5,481	5,624

EXHIBIT No. 5.

SHOWING BY WHAT AUTHORITY COMMITTED.

	PAST YEAR.	PREVIOUSLY.	TOTAL.
Hartford Superior Court.,		39	39
New Haven “	1	73	74
Fairfield “	2	72	74
Litchfield “	1	28	29
Middlesex “	1	10	11
Tolland “	0	16	16
New London “	0	19	19
Windham “	0	9	9
New Haven Common Pleas Court,	0	1	1
Hartford Police Court,	9	671	680
New Haven “	38	916	954
New London “	3	92	95
Norwich “	0	141	141
Waterbury “	12	246	258
New Britain “	3	168	171
Bridgeport “	11	329	340
Meriden “	2	196	198
Stamford “	2	33	35
Norwalk “	1	6	7
Middletown “	3	42	45
Danbury “	5	35	40
Derby “	0	21	21
Wallingford “	1	6	7
Stafford “	0	3	3
Greenwich “	0	5	5
Ansonia “	0	5	5
Rockville “	0	3	3
Birmingham “	0	1	1
Haddam “	0	3	3
Huntington “	0	2	2
New Canaan “	0	1	1
Willimantic Police Court,	1	0	1
Bethany Probate Court,	0	1	1
Justice Court, various towns,	53	2101	2154
Boarders “ “	4	177	181
Total.	153	5,471	5,624

EXHIBIT No. 6,

SHOWING THE VARIOUS WAYS BY WHICH THE BOYS HAVE LEFT THE INSTITUTION.

	PAST YEAR.	PREVIOUSLY	TOTAL.
Placed with Farmers, . .	15	544	559
Placed at various trades, . .	10	66	76
Sentence expired, . . .	0	941	941
Returned to Parents and Friends,	225	3,783	4,008
Sent to Deaf and Dumb Asylum, .	0	1	1
Sent to Hospital, . . .	0	7	7
Return'd to Providence Reform School,	0	5	5
Discharged to go to sea, . .	0	7	7
" selectmen, . .	1	1	2
" for Defective Mittimus,	0	23	23
" by order of Court, .	0	17	17
" by Legislature, . .	0	3	3
Remanded to Alternate Sentence, .	0	33	33
Released to be tried for Incendiarism	0	2	2
Died, ...	5	78	83
Boarders Dismissed, . .	2	167	169
Released to be tried for Assault,	0	2	2
Released to be tried for Burglary, .	0	2	2
Sent to Children's Home, . .	0	3	3
To Enlist in the Army, . .	0	26	26
Total.	258	5,711	5,969

EXHIBIT No. 7.

SHOWING BIRTHPLACE OF THOSE COMMITTED.

Connecticut,	119
New York,	8
Massachusetts,	6
Maryland,	1
Canada,	3
Ireland,	1
Germany,	3
Italy,	2
England,	4
Russia,	2
Scotland,	1
Hungary,	1
Sweden,	2
Total.	153

EXHIBIT No. 8.

PARENTAGE OF THOSE COMMITTED.

American,	58
Irish,	41
German,	15
French,	6
English,	8
Italian,	4
Scotch,	1
Russian,	2
Colored,	11
Austrian,	1
Sweden,	2
Canadian,	4
Total.	153

FARMER'S REPORT.

To the Superintendent of the Connecticut School for Boys.

The following tables show the amount of products grown during the year ending September 30, 1895, and the estimated value of the same. Also, an inventory of stock and tools used on the farm.

GROWN BY THE FARMER.

35	Tons English Hay,	$700.00
10	“ Hayed Oats,	150.00
3	“ Clover Hay,	45.00
5	“ Meadow Hay,	50.00
15	“ Sweet Corn Fodder,	150.00
5	Calves, three days old,	5.00
	Pigs,	42.50
	Service of Stock,	12.00
1586	Bushels of Potatoes,	1,110.20
500	Bunches Celery,	25.00
4000	Dozen Sweet Corn,	400.00
4,1867	Quarts of Milk,	2,512.02
	Stock sold to B. Leven,	95.00
	“ W. J. Corrigan,	18.00
		$5,314.72

GROWN BY MR. JOHN GALLAGHER, COTTAGE A.

2750	Heads Cabbage,	$137.50
90	Bushels Tomatoes	72.00
		$209.50

GROWN BY MR. J. A. SMITH, COTTAGE B.

3617	Quarts Strawberries,	$442.55
326	“ Black Raspberries,	48.90
534	“ Red Raspberries,	80.10
142	“ Blackberries,	21.30
1597	“ Currants,	159.70
30	“ English Gooseberries,	7.50
806	Bunches Asparagus,	80.60
440	“ Rhubarb,	22.00
1734	Heads Early Cabbage,	86.70
20	Bushels Cucumbers	12.00
		$962.35

GROWN BY MR. JOHN H. PARISH, COTTAGE C.

Season of 1894. Not reported		
325	Bushels Carrots.	$286.50
128	“ Parsnips	76.80
20	“ Salsify	10.00
Season of 1895.		
248	Bushels of Carrots,	124.00
358	“ of Onions,	358.00
1500	Bunches of “	30.00
78	Bushels of Beets,	46.80
400	Bunches of Beets,	8.00
1500	Heads of Lettuce,	30.00
2750	Bunches of Radishes,	55.00
110	Bushels of Turnips,	66.00
		$1,091.10

GROWN BY MR. F. P. OWEN, COTTAGE D.

178½	Bushels of Green Peas,	$160.65
	Turnips,	27.00
		$187.65

GROWN BY MR. C. S. FOX, COTTAGE E.

87	Bushels Snap Beans,	$78.30
14	“ White Wax,	12.60
51	“ Black “	45.90
34	“ Shell Beans,	30.60
17	“ Large Limas,	15.30
29½	“ Small “	26.55
		$209.25

GROWN BY MR. T. H. MAGUIRE, SOUTH DIVISION.

2268	Pounds of Squash,	$45.36
120	Bushels of Cucumbers,	72.00
		$117.36

GROWN BY MR. J. S. CRABB, NORTH DIVISION.

1894.		
330	Bushels Table Beets,	$198.00
941	“ Cattle “	470.50
1895.		
271	Bushels Table Beets,	162.60
441	“ Cattle “	224.00
		1.055.10
	Total,	$9.147.03

Respectfully,

M. H. Marston. *Farmer.*

INVENTORY OF CARRIAGES, TOOLS, ETC.

1	Hay Cart,	$40.00
1	Milburn Wagon,	100.00
1	Two Horse Dump Cart,	80.00
1	Deering Mower,	60.00

1	Horse Lawn Mower,	25.00
1	Hay Rake,	35.00
1	Advance Tedder,	40.00
1	Cutaway Harrow,	30.00
2	Spring Tooth Harrows,	90.00
1	Smoothing Harrow,	20.00
1	A Harrow,	5.00
1	Iron Roller,	20.00
1	Lawn Roller,	10.00
1	Land Side Plow,	10.00
1	Swivel “	10.00
1	Shovel “	5.00
2	One Horse Cultivators,	15.00
1	Breed's Weeder,	10.00
6	Wheelbarrows,	9.00
2	Sleds,	10.00
2	Seed Drills,	5.00
8	Rakes,	2.00
9	Garden Rakes,	3.50
8	Pitching Forks,	4.00
16	Manure Forks,	8.00
17	Potato Forks,	8.50
15	Spading Shovels,	7.50
16	Shovels,	8.00
1	Hay Cutter,	7.50
3	Chains,	3.00
2	Potato Diggers,	25.00
10	Picks,	5,00
2	Platform Scales,	30.00
10	Axes,	5.00
100	Hoes,	20.00
2	Crowbars,	3.00
6	Baskets,	5.00
7	Scythes and Snathes,	7.00
1	Stone Boat,	5.00
2	Grind Stones,	3.00
8	Hand Lawn Mowers,	32.00
1	Top Buggy,	150.00
1	Light Open Buggy,	45.00
1	Three Seated Carryall,	50.00

2	Two Seated Carriages,	150.00
1	Surry,	75.00
1	Express Wagon,	60.00
1	Chair Wagon,	125.00
1	Lumber Wagon,	25.00
1	Two Seated Sleigh,	100.00
1	Cutter,	50.00
1	Chair Sleigh,	25.00
1	Large Two Horse Sleigh,	55.00
1	Business Sleigh,	15.00
3	Sets Single Harness,	38.00
2	" Heavy Double Harness,	60.00
1	Set Light " "	20.00
	Total,	$1.845.00

INVENTORY OF LIVE STOCK.

1	Pair Working Oxen,	$100.00
20	Cows,	800.00
6	Store Hogs,	120.00
16	Shoats,	96.00
6	Horses,	600.00
1	Jersey Bull,	50.00
		$1,766.00

During the fall and winter of the season of 1894, we were visited by the Hog Cholera, and suffered to the extent of

6	Large Store Hogs,	$120.00
17	Chester White Shoats,	102.00
35	" " Pigs,	87.50
		309.50

THE SCHOOL AND ITS METHODS.

The Connecticut School for Boys, for delinquent and way ward boys, is beautifully located upon a high elevation of land in the City of Meriden, a thriving manufacturing city, with a population of 30,000 inhabitants, situated on the New York, New Haven & Hartford Railway, midway between the cities of Hartford and New Haven. The buildings of the Institution are less than a half mile from the center of the city, and are only ten minute's walk from the railroad station.

The farm belonging to the Institution lies in the rear of the buildings, and contains one hundred and ninety-five acres of land, one hundred acres of which are comparatively level, and well adapted to the raising of small fruits and garden vegetables, for which purposes it has already been largely appropriated. The balance of the land is somewhat broken, a portion being covered with a thick growth of small timber while the remainder furnishes good pasturage for the stock A living stream of pure water runs through the farm near its center.

The buildings of the Institution are mostly of brick, and are well constructed. They consist of one central building, five cottage buildings, a church edifice, a large boiler and coal house, an ice house. a bakery, a large hay and cow barn, a horse barn and carriage sheds, cattle sheds, hennery, piggery, wood house, etc,

The main or central building, fronts the east, is 300 feet long by 50 deep, the central portion being four stories high above the basement, the wings on either side being three stories high. Attached to the rear of the main building, on the west, is also a wing 120 feet long by 40 feet wide, which is three stories high above the basement. In the basement story of the main building are located the kitchen, laundry, engine room, six store rooms, milk room two large playrooms two bath rooms and two rooms for storage of coal. The kitch. en is furnished with four large steam kettles for cooking purposes, the steam being supplied from the boiler at the boiler house.

The bakery and bread room are conveniently connected with the kitchen, and under the same supervision.

The laundry is supplied with three of the Nonpariel washing machines of the largest size, and a large mangle. The accommodations for drying clothes by steam are ample. There are also conveniences for making starch and for preparing soap for the machines by steam.

The engine room contains a boiler of 25 horse power, and engine of 15 horse power. The power is used in running the machinery of the laundry; also for running eight sewing machines and the printing presses.

There are two play rooms, one for each division of the School, which are nicely furnished with settees sufficient to seat all the boys, and the rooms are pleasantly decorated with pictures and paintings of various kinds, and are very well supplies with newspapers and magazines. These rooms furnish a pleasant place for the boys who desire to spend a portion of their play time in reading or in innocent games.

The bath rooms are supplied with a plunge and shower bath. By the aid of steam the shower can be made of any desired temperature. The accomodations are so ample that all of the boys can be thoroughly bathed in thirty minutes. The rooms are well provided with looking glasses, combs and brushes, and pleasant conveniences for obtaining cool drinking water at all times,

The first story of the main building above the basement contains one general office a private office for the Superintendant, a reception room, a library room, three large school rooms with a seating capacity for one hundred boys each, two large wardrobe rooms for boy's Sunday clothing, one officers, sitting room, private dining room and kitchen for the Superintendent's family, a large dining room and kitchen for the officers of the Institution, two large dining rooms with a seating capacity for 375 boys, together with numerous closets pantries, halls, etc.

The second story contains parlors and sitting rooms, bed chambers and closets for Superintendent's family, six rooms for officers, four large shop rooms and two sleeping halls.

The sleeping halls have a capacity for comfortably lodging 375 boys. The halls extend to the top of the building, and are sufficently high to admit of two corriders above the main floor. The halls are light and pleasant, with good ventilation. They are furnished with single bedsteads, good mattresses, feather pillows, and plenty of bedding adapted to the season. The halls are also provided with six night closets, conveniently located, and with hydrants from which good drinking water can be obtained at all times. A night watchman looks carefully after the wants of the boys during sleeping hours.

The third story, in the center and end wings, contains fifteen rooms, which are used for guest chambers and sleeping rooms for officers of the Institution. In the rear wing of this story, there is a large shop, where 75 boys labor at cane seating chairs. The shoe shop is also on this floor.

The fourth story of the central portion of the building is used for hospital purposes, with rooms for the nurses, etc. The hospital contains nine wards, and is provided with hot and cold water, and all conveniences neccessary for making the sick comfortable.

In the rear of the main building there are two yards, surrounded by a high fence, in which the boys have ample time for exercise and play. There is also a yard of three acres of ground containing a pleasant grove of chestnut and oak trees, surrounded by a neat picket fence, five feet high, where the boys are often permitted to play, and where, in the summer time, they enjoy their holiday sports. The grounds surrounding the buildings are tastefully laid out and are well set with ornamental shrubs and flowers. The boys in the main building, or Congregate Department of the School number about two hundred, Five Cottages have been built, that very comfortably accommodate fifty boys each. They are built of brick, are three stories high above the basement, and cost about $16,000 each. The basement contains a large playroom, a room for storage, two bath rooms, and fruit cellar. All the basement rooms are well lighted and warmed, where heat is needed.

The first story contains a large school room, handsomely seated and furnished, officer's private rooms, a bath room, reception room, two dining rooms, a kitchen and pantry, and two halls.

The second story contains a sleeping halls for twenty boy a hospital room, a teacher's room, a bath room, a room for boy's Sunday clothings, a store room for bedding, etc., and a large shop room.

The third story contains a sleeping room for thirty boys, a bath room and a store room for bedding.

The buildings are finished in hard wood, are well furnished in every department, are lighted with gas, supplied with water from the city reservoir, and warmed by steam.

The buildings differ, architecturally in their outside appearance, but are substantially the same in their interior arrangements. Each cottage is supervised by a gentleman and his wife, and one lady teacher. They are conducted on what is known as the Open, or Family Plan, the boys being held in their places by kindness and home influences, instead of the more arbitrary appliances of bolts, and bars and high fences.

The chapel edifice is a beautiful structure, with a seating capacity for 500 boys. It contains a large platform, with convenient side rooms, which afford excellent facilities for giving concerts and other appropriate entertainments. A large organ stands on the platform. The chapel was erected at a cost of about $15,000.

The boiler house is a solid structure of brick and stone work, 35 by 57 feet, and is two stories high. The lower story is 18 feet high, and contains a room for the three boilers of 60-horse power each, and a coal room that furnishes storage for 300 tons of coal. The boiler room contains a receiving tank, force pump and all apparatus necessary to supply althe buildings with steam sufficient to warm them well and in the most approved manner, and to drive the machinery in the laundry and in the manufacturing departments. The chimney stack is 80 feet high, and gives an excellent draught in all kinds of weather. The upper story of the building contains a machine shop and living room for the engineer.

The farm buildings are commodious, and afford storage for all the carriages and smaller implements neccessary for the farm and for the use of the Institution. The main barn is 83 feet in length by 42 in width, and is three stories high. The lower or ground floor, is used as a manure cellar and for storing the winter supply of vegetables, the two being separated by a heavy cemented wall of stone. The capacity of these is about forty cords of manure and 2,000 bushels of vegetables. The middle story contains the stabling, running the entire length, arranged for the comfort and cleanliness of the stock, two rooms for such stock as need seclusion, a bedding room and bays for hay, which extend through the upper story to a height of 25 feet. The third story contains the driving floor, where the hay and fodder, as well as the grain, are well drawn and stored; a feed room and rooms for the smaller farm tools. Above the floor is a large space for grain or hay. The building is capable of storing seventy tons of hay, and is in all respects a model of convenience and economy of labor. Connected with this building by a carriage shed, is a horse barn 30 feet in length by 24 feet in width, conveniently divided into stabling, a harness room, and a lodging room for the hostler, while above these is ample room for bedding, hay and other feed. There is also attached to the main barn a shed 54 by 20 feet, which furnishes additional stalls for cattle, as well as protection for the spring water with which the stock is supplied, and for the more bulky farm implements. Another building near these 33 feet by 20 feet is used also for storing farm implements.

The piggery stands about 500 feet from the main, or school building, consists of a brick front, 34 feet by 20 feet, in which the cooking for the swine is done, and also the slaughtering of the pork. Extending from this is a wooden building, 65 feet by 12 feet, where the swine are kept. This is divided by movable partitions in to eight pens, or less, if desired, and is arranged with special reference to comfort of the animals and ease and convenience in their care.

The neat stock kept upon the farm includes twenty milch cows, and one pair of working oxen. None of these are full blooded, but are, with a single exception, Jersey or Ayrshire grades, and were nearly all raised upon the farm. No animals of this class are kept after they become unprofitable from old age, or failure of any kind, but are always converted into beef and sold. The services of five horses is required for freighting, driving and farm work. The swine kept are nearly all Chester White grades, and vary in number from twenty to forty. Very little grain is fed to them, as the number kept depends upon the amount of feed supplied by by the Institution.

WATER SUPPLY.

The Institution is supplied with water from two sources. The water of a never-failing spring, one mile and a quarter away, owned by the Institution, is conducted by a three-inch pipe to the buildings, and furnishes sufficient for cooking and drinking purposes ; also all needed water for the barns and piggery, and for irrigation at various points upon the farm. For the boilers, laundry, closets, and all general purposes the supply is obtained from the city water works. The pressure of this water is about eighty-five pounds, and is sufficent to force the water to any part of the buildings in case of fire. The Institution has three convenient hydrants and hose, that may be used should the necessity for their use ever occur.

GAS.

The Institution is supplied with gas from the city gas works.

INDUSTRIES.

There are ten shops in the Institution that give employment to over four hundred boys. In the tailor shop where the clothing worn by the boys is made and repaired, twenty boys are employed. There are about two hundred boys who work at cane-seating chairs in one large shop. A shoe shop gives employment to a small class. The farm and garden, in the summer time, call for a class of from thirty to forty boys; in the winter a small class cares for the stock and does the necessary work about the premises. From eight to ten boys work at the greenhouse and on the lawns. The laundry, dining rooms, kitchen, sleeping halls, etc., all require classes of from six to ten boys each.

FOOD.

The dietary of the Institution, while it does not embrace the variety ordinarily found on the tables of well-to-do people still, the quality of the food daily placed before the boys could be no better. The bread is made from a good grade of white flour, the meats used are of the best quality, and the vegetables are supplied abundantly from the Institution gardens, and embrace a full variety of such kinds as are found in the best market gardens. Coffee is furnished for breakfast and supper, in which all the milk from the Institution dairy is used averaging from 100 to 200 quarts daily. Once a week a bountiful dinner of fish, or fish chowder is given. The tables are supplied daily with butter or molasses, and, on Sunday, pies are given for dinner and cakes for supper. On Thanksgiving day a bountiful turkey dinner is furnished, and, on all other holidays, the tables are spread with all the delicacies of the season. The boys are allowed all they want to eat at every meal, and no boy need ever leave the table hungry. The deprivation, or a change of food, is never allowed as a punishment. The tables are nicely covered with white oil cloth, and are spread with white porcelain ware, silver plated knives and forks, spoons and casters. Good manners are taught and required at meal time.

CLOTHING.

The boys of the Institution are clothed in the best quality of all-wool gray cloth for pantaloons, and dark indigo blue army goods for jackets. Heavy Amoskeag Hickory is used for shirting; their caps are made to order from all-wool blue cloth, and their shoes and stockings are of good quality. They dress in summer in lighter goods according to the season.

RECREATION.

All holidays are devoted entirely to recreation and play. Portions of each week day, that will equal at least two hours of time, are also given for play. On Saturday afternoon, when the weather is suitable, the boys go to the ball grounds in an open field of many acres, where they enjoy full freedom in playing ball or such games as may suit their tastes best. Many opportunities are given to attend appropriate amusements at the Opera house in the city, and frequent rehearsals concerts and exhibitions are given for the benefit of the boys in our own chapel. They attend the Agricultural Fairs given in the park near by, and always take part in the ceremonies on the day devoted to the decoration of the soldiers' graves.

RELIGIOUS AND MORAL INSTRUCTION.

Two services are held in the chapel each Sabbath ; Sabbath School in the morning and preaching in the afternoon.

The "International Lesson Leaves" are used in the Sunday School. These lessons, with the explanation, prayers, responsive exercises and music, make a very interesting and profitable service.

The ministers from the several churches of the city preach in their turn at the Sunday afternoon service.

The Sisters of Mercy instruct the Catholic boys of the School an hour each alternate Sabbath, and priests are in attendance for Mass once in two weeks.

Devotional exercises are held morning and evening each day of the week, and grace is said before all meals.

There is a moral review every evening, at which time a record is made in a book, kept for the purpose, of every boy's conduct during that day. These records determine a boy's standing in the School at all times.

SCHOOL.

All the boys attend school three hours each week day ten months in the year. The schools embrace eleven grades or divisions, which give every boy the opportunity to attend a class exactly adapted to his scholarship, and, as a rule, substantial and praiseworthy progress is made in study. Much attention is given to the subjects of reading, writing, spelling and arithmetic. Any boy, with an average mind, can, while at the school, obtain an education that will fit him to transact the ordinary business of life.

MUSIC.

Much attention is given to music, both vocal and instrumental. All the boys are taught vocal music, and about thirty boys are under constant training in instrumental or band music. Great proficiency is made in both departments

SENTENCES.

Boys between the ages of seven and sixteen years can be sent to the school during minority by any court of record in the State. Parents or guardians may secure the admisson of their sons or wards without process, by paying three dollars per week, quarterly in advance, for their board.

DISCHARGES.

Boys are dismissed on probation after they obtain the "Honor Grade," and this grade, by uniform good conduct, can be attained in one year after entering the School. By indifferent or bad conduct, promotions are lost, and, as a result the time for a boy to remain it the School is lengthened.

All boys that go out on leave of absence are required to communicate with the Institution once in six months, and by failing to do so, are at once looked after by the authorities of the School. A record is kept, as far as is possible, of every boy's conduct after he leaves the Institution.

The Board of Trustees has discretionary power to dismiss any boy from the Institution whenever the interest of the School or the boy will be promoted by such dissmissal.

NAMES, RESIDENCES, COMMISSION AND RETIREMENT OF THE TRUSTEES OF THE CONNECTICUT SCHOOL FOR BOYS, FROM ITS COMMENCEMENT TO THE PRESENT TIME.

Date of Commission.			Date of Retirement.
1851	Gideon Wells,	Hartford,	1853
1851	Phileman Hoadley,	New Haven,	1857
1851	E. S. Abernethy,	Bridgeport,	1853
1851	A. N. Baldwin,	West Milford,	1855
1851	Philo M. Jackson,	Norwich,	declined.
1851	Erastus Lester,	Plainfield,	1854
1851	Henry D. Smith,	Middletown,	1853
1851	John H. Brockway,	Ellington,	1852
1853	Philip Ripley,	Hartford, died in office,	1863
1853	David Patchen,	Weston,	1854
1853	John P. Gulliver,	Norwich,	1854
1853	John S. Yoemans,	Columbia,	1856
1853	James Phelps,	Essex,	1855
1854	Fred S. Wildman,	Danbury,	1858
1854	Moses Pierce,	Norwich,	1856
1854	John Gallup, (2d)	Brooklyn,	1858
1855	Sylvester Spencer,	Litchfield, resigned,	1858
1855	Elihu Spencer,	Middletown,	declined.
1856	Moses Culver,	Middletown,	1858
1856	Thomas Clark,	Coventry,	1860
1856	W. P. Benjamin,	New London,	1876
1857	W. S. Charnley,	New Haven,	declined.
1858	E. W. Hatch,	Meriden, resigned,	1859
1858	Horace Gaylord,	Ashford,	1862
1858	David P. Nicholas,	Danbury,	1875
1858	Thomas A. Miller,	Torrington,	1859
1858	Benjamin Douglas,	Middletown,	1876
1859	Hiram Foster,	Meriden,	1873
1859	Daniel G. Platt,	Washington, d. in office,	1871
1859	Henry McCray,	Ellington,	1876

Date of Commission.			Date of Retirement.
1862	ROSWELL BROWN,	Hartford, d. in office,	1877
1862	WILLIAM SWIFT,	Windham,	1866
1863	HENRY B. HUBBARD,	Middletown,	declined.
1866	JAMES B. WHITCOMB,	Brooklyn,	1874
1871	GEORGE LANGDON,	Plymouth,	1875
1873	HIRAM A. YALE,	Meriden,	1877
1874	S. B. COCKS,	Huntington, resigned,	1876
1874	F. O. BENNETT,	Willimantic, retired,	1882
1875	DELOS H. STEVENS,	Barkhamstead, retired	1889
1875	CHAS. FITZGERALD,	Middletown, retired,	1891
1875	EDW'D W. SEYMOUR,	Litchfield, retired,	1876
1875	GOODWIN COLLIER,	Hartford, retired,	1876
1885	CHAS. L. ENGLISH,	New Haven,	resigned.
1876	JOHN M. BREWER,	Norwich, died in office,	1878
1876	G. H. PRESTON, M.D.,	Tolland, " "	1883
1877	VINCENT COYLER,	Darien, retired,	1886
1877	JOHN L. HOUSTON,	Thomsponville,	still in office.
1878	A. P. WILLOUGHBY,	Norwich, retired,	1879
1879	CHARLES FABRIQUE,	N. Haven, d. in office,	1889
1879	J. S. LATHROP,	Norwich, retired,	1891
1879	THEODORE BIRD,	Bethlehem, retired,	1891
1882	ALBERTUS S. BRUCE,	Pomfret, retired	1893
1883	CHARLES F. SUMNER,	Bolton, retired,	1895
1886	JAMES K. BUTLER,	Darien, retired,	1893
1889	JAMES N. STATES,	New Haven, retired,	1895
1891	HERMAN HOFFMAN,	New Preston, retired,	1895
1891	NATHAN D. BATES,	Preston, retired,	1895
1891	JAMES DONOVAN,	Middletown, retired,	1895
1893	SAMUEL THATCHER,	Warrenville, retired,	1894
1893	JOHN MCCARTHY,	Danbury,	still in office.
1894	DAVIS A. BAKER,	Warrenville retired,	1895

RESIDENT TRUSTEES.

1877	ISAAC C. LEWIS,	Meriden, died in office,	1894
1877	CHARLES L. UPHAM,	" retired,	1891
1877	OWEN B. ARNOLD,	" "	1891
1887	D. S. WILLIAMS,	" "	1893

Date of Commission,			Date of Retirement.
1891	SETH J. HALL,	Meriden,	still in office.
1891	C. H. S. DAVIS,	“	“
1893	JOHN C. BYXBEE,	“	“
1894	N. L. BRADLEY,	“	“

NAMES OF SUPERINTENDENTS

OF THE

CONNECTICUT SCHOOL FOR BOYS.

Date of Appointment.	NAMES.		Date of Retirement
1853	Philimon, Hoadley,		1855
1854	Saxton B. Little, Ass't Supt.,		1875
1855	Roswell Hawley, M. D.,		1859
1858	Edward W. Hatch, M. D.,	Died. Feb. 7,	1874
1874	Saxton B. Little, Acting Supt.,	July 1,	1874
1874	Edward Ingham,	July 1,	1876
1876	S. B. Cocks,	Dec. 1,	1877
1877	J. W. Brown, Acting Supt.,	Apr. 23,	1878
1878	Geo. E. Howe,	Died in office, Nov. 23,	1893
1893	Mrs. F. M. Howe	Apr. 11,	1894
1894	Rev. Samuel Thatcher,	still in office.	

FORM OF INDENTURE

ADOPTED BY THE TRUSTEES.

To the Trustees of the Connecticut School for Boys :

I hereby request that the boy named

received as indentured, according to the law, to the Connecticut School for Boys, at Meriden, and I hereby bind myself and agree to the following conditions, viz:

The price of board, education, training and clothing for said boy shall be at the rate of Three Dollars per week, payable quarterly, in advance, and the said

is bound to remain in the Institution for the term of months, entitled to the same supervision, medical treatment, support and education, and subject to the same regulations, employment and restraint as all other inmates of said School.

(Signed)

CIRCULAR OF

Information to Parents and Guardians.

———o———

We take the pleasure of informing you that
your was this day duly received at this Institution, here to remain during his minority, or until otherwise discharged in accordance with the rules of the School. Any boy, by uniform good conduct, can reach his "Honor Grade" in one year from the time he enters the School. He is then given a probationary discharge to go to his home, where he will be permitted to remain as long as he does well. If his conduct in the School is not good, the time for his receiving his probationary discharge will be increased. For further information, it is proper to state that the Institution is not a prison, but a School for detention and reform where the inmates receive such instruction and training as are best adapted to form and perpetuate a virtuous character to establish habits of industry, and to advance them in those branches of knowledge which are taught in the Common Schools in the State. They are provided with a home in every way pleasant and comfortable, are furnished with steady employment, of a kind that will aid them in earning an honest living after they leave the School. They have appropriate seasons for recreation and play, are well fed and clothed, and, when sick, have the best of care and medical attendance. They attend school regularly six days of the week, are taught by efficient and experienced teachers, and on Suuday enjoy the privileges of the Sabbath School and regular Chapel service, over which some minister of the Gospel from one of the city churches presides. The Catholic boys of the Sceool receive one hour of instruction each Sabbath from the Sisters of Mercy.

In order to accomplish the wise ends for which this Institution was established, to wit : the reformation of boys intrusted to its care, it will be necessary for them to remain in the School for a sufficient length of time to receive such training and discipline as will serve to reform their evil ways, and to establish in them correct moral principles and habits of industry.

Applications for the discharge of boys from the Institution are frequently made in a short time after their commitment, but of course these applications are not entertained. Experience has taught the management that the best interests of the School are promoted by treating the boys all alike, and by requiring all to procure their "Honor Badge," before leaving the School. If there is a deviation from the rule in a *single* case, every other boy has the *right* to ask for the same deviation in *his* case, and the Institution would lose its reformatory character.

Parents, guardians and other near friends are permitted to visit the boys on the first Wednesday of each month, at which time no pains will be spared in giving all information sought for in relation to the standing of any boy in the School.

The boys are permitted to write to their friends once a month, and the friends are allowed to write to the boys at their pleasure. In case of serious illness of any boy, his friends will at once be advised of his condition.

AMENDMENTS TO LAW

Relating to the Connecticut School for Boys, Meriden.

Be it enacted by the Senate and House of Representatives in General Assemby convened.

Section 1. Whenever any boy under the age of sixteen years shall be convicted of any crime or misdemeanor, punishable by fine or imprisonment other than imprisonment for life, the Court, or Justice of the Peace, as the case may be, may commit him to the Connecticut School for Boys, to remain until he shall arrive at the age of twenty-one years, unless sooner discharged by the Board of Trustees. And the Judges of the Criminal and Police Courts of the State, and Judges of the Peace, shall have power to commit to the Connecticut School for Boys: First, any boy under sixteen years of age who may be liable to punishment by imprisonment under any existing law of the State, or any law that may be enacted and in force in the State: second, any boy under sixteen years of age, with the consent of his parents or guardian, against whom any charge of committing any crime or misdemeanor shall have been made, the punishment of which, on conviction, would be confinement in jail or prison; third, and boy under sixteen years of age, who is destitute of a suitable home and adequate means of obtaining an honest living, or who is in danger of being brought up, or is brought up, to lead an idle or vicious life; fourth, any boy under sixteen years of age, who is incorrigible, or habitually disregards the commands of his father or his mother or guardian, who leads a vagrant life, or resorts to immoral places or practices, or neglects or refuses to perform labor suitable to his years and condition, or to attend school.

Sec. 2. That every boy sent to the Connecticut School for Boys shall remain until he is twenty-one years of age, unless sooner discharged or bound as an apprentice; but no boy shall be retained after the Superintendent shall have reported him fully reformed.

Sec. 3. That whenever there shall be as large a number of boys in the School as can be properly accommodated it shall be the duty of the President of the Board of Trustees to give notice to the Criminal and Police Courts of the fact, whereupon no boys shall be sent to the School by said Courts until notice shall be given them by the President of the Board that more can be received.

Sec. 4. If any person shall entice or attempt to entice away from said School, any boy legally committed to the same, or shall knowingly harbor, conceal or aid in harboring or concealing any boy who shall have escaped from said School, such person shall, upon conviction thereof, be deemed guilty of a misdemeanor, and shall pay a fine of not less than ten or more than one hundred dollars, which shall be paid to the Treasurer of the Board of Trustees; and every sheriff, deputy sheriff, constable or officer of the local police, or any officer or employee of said School, shall have power, and it is hereby made his duty, to arrest any boy, when in his power to do so who shall have escaped from said School, and return him thereto.

Sec. 5. That the Trustees shall have full power to place any boy committed as herein described, during minoirty, at such employment, and cause him to be instructed in such branches of useful knowledge as may be suitable to his years and capacity as they may see fit: and they may, with the consent of any such boy, or his parents or guardians, bind him out as an apprentice during his minority, or for a shorter period, to learn a trade,or to other employment, as in their judgment will tend to his future benefit; and the President of the board shall, for such a purpose, have power to execute and deliver, on behalf of the said Board, indentures of apprenticeship for any such boy, and such indentures shall have the same force and effect as indentures of apprenticeship executed by his legal guardian, and shall be filed with the records in the office of the Connecticut School for Boys.

Sec. 6. In case any boy so apprenticed shall prove untrustworthy and unreformed, the Trustees may, at their discretion receive such boys into the Connecticut School for Boys, to be held in the same manner as before his said apprenticeship, and may there upon cancel the indentures of such boy. And if, in the opinion of the Trustees, any boy apprenticed out by them shall have an unsuitable home, or if the person to whom such boy is indentured shall become unfit or incapable to properly raise or take care of him, the Trustees may, at their discretion, return such boy to the School.

Sec. 7. Whenever a boy is dissmissed from the School to his parents, or to otherwise care for himself, (except by indentures, as in the foregoing section,) he shall be dismissed on probation merely, and the Board of Trustees shall have power to send for and return him to the School, when, in the opinon of a majority of the members of said Board, the interest of the boy will be promoted by such return.

Sec. 8. All acts inconsistent with the foregoing are hereby repealed.

An Act in Addition to an Act Entitled "An Act Concerning Education."

Resolved by this Assembly: That in the several Reform School in this State, equal privileges shall be granted to clergyman of all religious denominations to impart religious instruction to the inmates thereof, and that every opportunity be allowed such clergyman to give to the inmates belonging to their respective denominations such religious and moral instruction as said clergymen may desire, and the Trustees of said Institution shall prescribe reasonable times and places, not inconsistent with the proper management of said Institution, when and where such instruction may be given, and such instruction shall be open to all who may choose to attend.

Approved July 25, 1874.

BY-LAWS.

MEETINGS OF THE TRUSTEES.

Sec. 1. There shall be a regular meeting of the Board of Trustees held at the School in MERIDEN, on the second Wednesday of January, April, July and October, in each year, and the July meeting shall be the annual meeting.

Sec. 2. Special meetings shall be called by the President of the Board at the written request of two members, provided that ample notice of such meetings shall be given.

Sec. 3. A majority of the members shall constitute a quorum for the transaction of business, but a smaller number present at any regular or special meeting may adjourn to any specified time.

Sec. 4. The Board of Trustees shall be organized annually at the regular meeting held in July, by the election, by ballot, of a President, Secretary, Treasurer, an Executive Committee, to consist of three members, and an Auditing Committee to consist of two members.

PRESIDENT.

Sec. 5. It shall be the duty of the President to preside at all the meetings of the Board, but in his absence, the Board shall appoint a chairman *pro tem.*

SECRETARY.

Sec, *6.* It shall be the duty of the Secretary to keep an accurate record of all proceedings of the Board in a book provided for that purpose, which shall, at all times, be open to the inspection of any members; to prepare all documents and statements which may be ordered by the Board ; to take charge of all communication, and reply thereto in accordance with such instruction as he may receive from the Board or Executive Committee.

TREASURER.

Sec. 7. The Treasurer shall receive and disburse the moneys of the Institution, and keep a true and just account of the same. He shall pay no bills except on an order drawn by the Superintendent, and countersigned by the Executive Committee, and for the faithful performance of his duties he shall give a satisfactory bond in the sum of eight thousand dollars

EXECUTIVE COMMITTEE.

Sec. 8. It shall be the duty of the Executive Committee to make or order the Superintendent to make purchases for the School, to authorize such repairs as may, from time to time, be necessary; but no expenditures for repairs exceeding one hundred dollars shall be authorized except by the Board. They shall examine as to whether economy is observed in the different department of the School, and the quantity and quality of food and clothing furnished. They shall, once in each month, or oftener, if they choose, without notice to the Superintendent or other officers, inspect the School buildings, and all the departments, rooms and closets thereof, and see that all are kept perfectly clean and neat ; they shall inquire into the behavior of all officers and employees and in a book, kept for that purpose, enter all their proceedings and observations, which book shall be laid before the Board at every meeting. They shall also, at each monthly meeting, examine all bills presented by the Superintendent and, if fond correct, approve the same.

Sec. 9. There shall be as many meetings of the Executive Committee as the interests of the School require.

AUDITING COMMITTEE.

Sec. 10. It shall be the duty of the Auditing Committee to examine the accounts of the Treasurer thoroughly and minutely, up to the 30th day of September in each year, and report thereon to the Board at the next regular meeting.

OFFICERS.

Sec. 11. The following named officers of the School shall be appointed by the Board of Trustees, whenever their services may be required, viz; a Superintendent, an Assistant Superintendent, Bookkeeper, Matron, Teachers, Overseers of the workshops, and a Farmer.

Sec. 12 The several officers shall hold their appointment during the pleasure of the Board, and no resignation shall take effect until three months after being tendered in writing except by consent of the Board of Trustees.

SUPERINTENDENT.

Sec. 13 The Superintendent shall have the general charge of the Institution.

He shall see that the subordinate officers are punctual and faithful in the discharge of their respective duties, and that their regulations and by-laws are carefully observed.

He shall keep a journal and make a record of all occurrences worthy of notice, which shall be subject to the inspection of any member of the Board

He shall perform all the correspondence, keeping files of all letters received and copies of those sent, as far as important for reference. In suitable books he shall keep regular and complete accounts of all property entrusted to his care, showing the expenses and income of the Institution.

He shall make out and present to the Treasurer of the Institution the bill for weekly board of inmates, and perform all the duties of this department according to law.

Under the advice and direction of the Executive Committee, he shall procure the necessary supplies for the Institution, and purchase all such articles and materials as may be wanted for the support and employment of the boys, and dispose of all articles raised on the farm, or manufactured by them, which are not wanted for use.

In a suitable book, he shall keep an account of all purchases and the cost of delivering the same at the Institution.

He shall daily inspect every part of the premises, and have a watchful care over the inmates, and be responsible for the proper care and discipline of the boys.

He, or the Assistant Superintendent, shall examine all packages and letters received for the boys, and shall examine their letters before being sent away.

He shall see that they receive no detriment to health for want for sufficient clothing by day or by night, from wet or cold, or from other exposure, and that the rooms and buildings are properly warmed and ventilated.

He shall employ, whenever necessary, suitable persons for any temporary services not provided for in these by-laws and report the same to the Executive Committee.

At each quartely meeting he shall report to the Board the number of boys committed to the Connecticut School for Boys, also communicate full information of the state of the Institution, and make such suggestions as he may think proper for the consideration of the Board.

At the July meeting he shall furnish the Board with a duplicate copy of his accounts, presented to the State Comptroller of Public Account, up to the 30th day of June ; also a full schedule of all property of the Institution, including everything in the care of the farmer.

He shall at all times be ready to perform whatever other services may be required by the Board of Trustees, for the benefit of the Institution.

The Superintendent shall have the direction of the moral and religious instruction of the inmates. He shall perform devotional service, morning and evening; have charge of the Sabbath School, and obtain such aid from the reverend clergy in the vicinity as may be necessary.

He shall occasionally give familiar expositions of moral and religious duty in such a manner as he shall deem most conducive to the good of the boys, and at such times as may be determined on by consultation with the Trustees.

He shall mingle freely with the boys, in kind, familiar intercourse, and spend as much time with them in conversation as he may think for their benefit, and as will be consistent with the proper performance of his duties and his position in the Institution.

At the quarterly meeting of the Trustees in July, he shall make a report, stating all facts respecting the reformatory influence effectively made use of in this Institution.

ASSISTANT SUPERINTENDENT.

Sec. 14. The Assistant Superintendent shall assume and perform all the duties of the Superintendent during his absence or inability.

THE MATRON

Sec. 15. The Matron shall have the general charge and direction of all the domestic arrangements of the family, and shall see that cleanliness, order and propriety are uniformly maintained in her department.

She shall see that all female assistants, except, teachers, are diligent and faithful in the discharge of their respective duties, discreet and regular in their deportment, and strict in their observance of all regulations of the Institution, and shall report to the Superintendent any remissness that may come to her knowledge.

She shall confer and advise with the Superintendent respecting the duties of the persons employed in the departments under her charge, and also as to the general management of the house.

TEACHERS.

Sec. 16 The Teachers shall instruct the boys in such branches of education as may be required by the Superintendant, and shall use all proper means to inspire them with a love of study, and lead them justly to estimate the value of a sound and practical education, and shall constantly strive, by precept and example, to empress on their minds the importance of good order, self-government, and purity of body and mind.

They shall take charge of the boys at all times in the school-rooms, and shall require them to be promptly in their places at the appointed time, unless they are absent by permission of the Superintendent.

They shall attend to the cleanliness and good order of the school-rooms, and shall be responsible for the safety, care and preservation of all books, furniture, apparatus and fixtures provided for the same; and by strict personal examination, see that no injury or waste is suffered.

They shall assist in the Sabbath School, in the care of the boys on the Sabbath, in vocal music, and the principle teacher shall act as librarian to the boys.

OVERSEERS OF WORKSHOPS.

Sec. 17. The overseers of the workshops shall take charge of all tools used in their respective departments, and see that the same are carefully preserved and account for; shall see that all stock and material are worked with prudence and economy and are properly manufactured. They shall keep accurate accounts of the number of boys and time employed each day, of the work done and all articles made and how disposed of. They shall attend to the cleaning, warming and ventilation, and keep a daily record of the temperature of their workshops.

They shall have charge of the boys during the workhours in the shops; shall exercise a prudent and judicious oversight, see that industry and good order are constantly observed, and return them to the yard, or such other place, and at such time as may be ordered by the Superintendent. They shall also assist the teacher if requested, in their duties on the Sabbath, and in the Sabbath School.

WATCHMAN.

Sec: 18. The Superintendent will have power, with the approbation of the Executive Committee, to appoint one or more watchmen for night duty, whenever it is considered necessary for the safety of the Institution.

The watchman on duty shall, if required perform a regular patrol throughout and around the building. He shall use the utmost vigilance to guard against damages by fire, to prevent escapes, and promptly notify the Superintendent on the first cause of alarm. He shall ring the bell in the morning, and at other times as may be directed, and perform any other service required by the Superintendent.

FARMER.

Sec. 19. The Farmer, under general or specific directions of the Superintendent, shall have charge of all the farming operations, and shall be responsible for the proper management, good order and economical use of everything connected therewith, and shall use every means in his power to increase and preserve the products of the farm.

He shall take charge of work with, and be responsible for such boys as the Superintendent may detail to be employed on the farm, and must patiently and perseveringly instruct them in the various kinds of farm work; require of them prompt obedience, and must, by example, together with constant and vigilant supervision, teach them to faithfully perform all duties required of them.

He shall see that all domestic animals are cared for in the best manner, well fed, properly cleaned and kindly treated.

He shall keep an accurate account of everything purchased, for the labor performed, and the amount of each kind of produce raised on the farm.

He shall see that all rules and regulations of the Institution are strictly observed by all persons under his care, and shall promptly report to the Superintendent any one who may refuse or neglect to comply therewith.

THE LIBRARY.

Sec. 20. A library of well selected books and maps, and of Sunday School books, shall be kept at the School for the use and improvement of the inmates thereof.

The Superintendent, Librarian and Chairman of the Exectutive Committee shall be a standing Committee on the Library, who shall have in charge the efforts, ways and means to promote this department of the Institution, and they shall report to the Board of Trustees, at the quarterly meetings, the progress and conditions of the Library, with a full list of all the donations received for this object.

VISITORS.

Sec. 21. Visitors will always be welcome to visit the School between the hours of 9 A. M. and 4 P. M. on week days and on Sunday for the purpose of attending the religious exercises but on that day they must leave immediately after the services are ended.

Parents will not be permitted to see their children oftner than once a month, unless by special permission of the Superintendent; and any article designed for any inmate must pass through the hands of the officer in attendance.

Visitors passing through the house or shops must not go among the boys, or address any conversation to them, except by permission of the attending officer.

Any visitors who shall attempt to give any inmate tobacco or other articles secretly, shall be altogether excluded from the premises.

Visitors shall not be permitted in or on the premises except attended by an officer of the Institution.

GENERAL REGULATIONS.

Sec. 22. The distribution of time for each working day shall not be less than six hours for labor, four hours for school, and from four and one-half to five hours for devotional exercises, incidental duties and recreation.

The time of rising shall be half past five o'clock A. M., from the first day of March to the first day of November, and at six o'clock during the other four months. The time of retiring shall be at eight o'clock P. M.

All persons having requisite duties to perform shall rise promptly at the ringing of the morning bell.

No person regularly employed at the Institution shall be absent from his or her duties without permission from the Superintendent, or his assistant, and person getting such permission will be required to procure a substitute, to be approved by the Superintendent, to fulfill his or her duties during their absence.

It shall be incumbent on each officer to see that all rules and regulations are strictly observed, and they shall promptly report any failure therein. As the great object is *reform* the intercourse of *all* with the boys should be so conducted as to convince them that this object is the chief end and aim of the School.

Every boy shall, at all times, be in charge of some responsible person, unless otherwise directed ; any boy escaping by or through the neglect or carelessness of any officer, the whole or part of the expense incurred in his capture may be charged to such officer and deducted from his salary by order of the Trustees.

No person shall take or detain a boy from the performance of one duty to discharge another, without direction from the Superintendent : and no boy shall be kept or allowed to remain out of School without special permission from the Superintendent.

Any person having charge of the boys during their time of recreation, shall see that a kind and proper tone of feeling is observed among them, and that they do not use violence, or injure each other's clothing, mar or deface the buildings, fixtures or furniture.

All persons employed at the Institution, who are in health and can leave their appropriate duties at the time, shall attend the daily devotional exercises, and the religious services on the Sabbath, unless special leave of absence is granted.

No spirituous liquors or intoxicating drinks shall be brought to the Institution, unless by order of the physician. No officer or assistant shall at any time make use of such liquor, nor shall any one make use of tobacco, or smoke a pipe or cigar on or about the premises.

No tobacco shall be furnished or allowed to the dilinquents in any form.

No officer shall be compelled to perform any duty inconsistent with those regularly assigned to him ; but as this Institution is to be a family, as well as a School for detention and reformation, duties will occur growing out of this double relation which no by-laws can clearly indicate or provide for ; therefore *all* are expected to act agreeably to the *spirit* as well as the *letter* of the rules and regulations, and hold themselves ready at all times for any emergency to aid in preserviug order preventing escapes and maintaining the rules and discipline of the School, and by general and constant acts, of accommodation, firmness, and kindness accomplish the desired object.

DISCIPLINE.

The discipline shall be that of the family, the School, the workshop and the farm, and not that of the prison. The inmates are to be watched over as pupils, and not guarded as prisoners or criminals; and there shall be no more restraint then shall be necessary to develope good, and repress bad qualities. Self-instruction, self-desire to labor, and self-government shall be inculcated and encouraged as the best culture, as well as the most effective discipline.

Punishment shall be imposed as a public judgment, in manner and form to be prescribed by the Superintendent, and never under excitement of the moment. Its severity shall always be proportionate to the magnitude of the offense. It shall consist of deprivation of play or marks of disapprobation or demerit, solitary confinement, and the use of the rod, as resorted to in well regulated families. Personal chastisement shall only be inflicted for some high misdemeanor or repeated offense, and only on the order of the Superintendent, and in case of severe punishment, only in his presence, or that of his assistant.

These By-Laws, or any part thereof, may be altered, amended, or repealed, at any regular meeting of the board of Trustees.

Amended July 14, 1886.

STRATFORD AND BRIDGEPORT NATURAL OYSTER BEDS. BUOYED BY THE STATE.

ANNUAL REPORT

OF THE

SHELL-FISH COMMISSIONERS.

STATE OF CONNECTICUT.

1895.

* * *

BRIDGEPORT, CONN.:
The Standard Association, Printers and Publishers.
1895.

REPORT.

To the Hon. O. Vincent Coffin, Governor of the State of Connecticut:

In accordance with a resolution passed at the legislative session of January, 1895, requiring all Boards and Commissions of the State to present annual reports, instead of bi-ennial as heretofore, the Shell-Fish Commissioners have prepared and herewith respectfully submit their report for the year ending September 30th, 1895.

THE COMMISSION.

The present Commission was organized in July, 1895, and consists of Geo. C. Waldo, Christian Swartz, and Geo. W. Hallock, the latter in place of Charles W. Beardsley whose term had expired. Mr. G. C. Waldo was chosen Chairman and Mr. Frederick Botsford was appointed Clerk for the ensuing year, under the new law transferring the duty of appointing the Clerk to the Commissioners.

THE FINANCIAL STATEMENT.

The financial statement shows total receipts for the year to have been $6,862.75, and the total disbursements $5,845.93, leaving a balance of $1,016.82. This is smaller than last year, but when the salary and expenses of Mr. Beardsley, the retiring Commissioner, which had been allowed to accumulate during nearly his entire term, and the extra expense of the Inspector of Natural Oyster Beds, in all amounting to over $1,800, are deducted from the disbursements, the balance in favor of the State will be seen to be nearly normel.

For boat licenses the receipts have been $695.50 and the disments $420.65, leaving a balance to the State of $274.85. This might properly be added to the balance already shown in the previous statement.

NEW LEGISLATION.

At the January session of the Legislature, 1895, quite a number of Acts and Amendments affecting the oyster business were passed.

For the purposes of consideration, taking these in the order of their passage we begin with the following Act:

CHAPTER XX.

AN ACT CONCERNING LICENSES FOR OYSTER BOATS AND VESSELS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section two of Chapter CLXXI of the Public Acts of 1893, being an Act concerning the licenses for oyster boats and vessels, is hereby amended by inserting after the words "for one year," the words "from the twentieth day of July in each year," so that the first sentence of said Section as amended shall read as follows: Any person, desiring to use any boat or vessel for such purpose, may make written application to the Clerk of Shell-Fisheries, stating the name, owner, rig, general description, tonnage, and place where any such boat or vessel is owned, and said Clerk of Shell-Fisheries shall issue to the owner of such boat or vessel a license to take and gather oysters from the natural oyster beds in the exclusive jurisdiction of the State for one year, from the twentieth day of July in each year, unless sooner revoked, upon the payment of two dollars for a vessel or boat under five tons, and for a vessel or boat exceeding five tons fifty cents for each additional ton, Custom-house measurement; *provided*, that before such license is granted the owner or master shall prove to the satisfaction of said Clerk of Shell-Fisheries that such boat or vessel is legally entitled to work on the public beds of the State, and that the captain and crew of such boat or vessel have been residents of this State for one year next preceding the date of such license, and that the dredges and other contrivances do not weigh more than thirty pounds, as provided in Section 2404 of the General Statutes.

Approved, March 28th, 1895.

This, it will be seen, is an Amendment making the twentieth day of July in every year the date for the expiration of licenses, no matter when taken out, and this will greatly facilitate the labor of licensing the boats as well as make the date of expiration more easily kept in mind by the licensees.

TAKING OYSTERS IN THE HOUSATONIC RIVER.

The following bill concering the taking of oysters from the natural beds of the Housatonic was passed:—

CHAPTER LXXXI.

AN ACT CONCERNING PROTECTION AND PRESERVATION OF NATURAL OYSTER BEDS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. Chapter XC of the Public Acts of 1893, is hereby amended to read as follows: Every person who shall, between the twentieth day of July and the tenth day of September, in any year, gather or take any oysters or shells from any natural oyster beds within the exclusive jurisdiction of the State, and every person who shall, between the first day of January and the tenth day of September, in any year, gather or take any oysters or shells in the Housatonic River shall be fined not more than fifty dollars, or imprisoned not more than thirty days, or both; *provided*, that nothing in this Section shall be construed to prohibit the gathering or taking of shells or mussels by the use of tongs, in said Housatonic River, below a line drawn from a stake on the west bank of said River at Quimber's Neck Point, so called, and running thence in a northeasterly direction to a stake on the east side of the channel of said River. Said stakes shall be located at said points by the Board of Selectmen of the Town of Stratford, and a certificate of such location by said Board shall be recorded in the office of the Town Clerk of said Town of Stratford.

Sec. 2. No person shall take or gather any oysters or shells in the Housatonic River, in any boat or vessel, unless said boat or vessel shall have been duly licensed and numbered in the manner hereinafter provided, and only by the use of tongs. For the purpose of this Act, the Housatonic River shall be deemed to extend to a line extending from the southern extremity of the Breakwater at the mouth of the River to Stratford Point, so called.

Sec. 3. Any person desiring to use any boat or vessel, for the purpose specified in the preceding Section, may make written application to the Shell-Fish Warden in the Town of Stratford, who shall be appointed by the Board of Commissioners of Shell-Fisheries, as provided in Section 2311 of the General Statutes, or if there be more than one Shell-Fish Warden in said town, then to such Shell-Fish Warden as the Board of Commissioners of Shell-Fisheries shall designate, in which said application shall be stated, under oath, the name of the owner, and a general description of such boat or vessel, the residence of said applicant, the length of time that he has been a resident of this State, and the place or places in which he has resided for a year prior to the date of said application; and said Shell-Fish Warden shall thereupon issue to said applicant a license to take and gather oysters and shells by the use of tongs, in said Housatonic River, for a period from the tenth day of September, in the year in which said application is made, to the first day of January following, unless sooner revoked, upon payment to said Shell-Fish Warden of two dollars for each boat or vessel to be so used, of which one dollar may be retained by said Shell-Fish Warden as his fee, and the remaider shall be paid to the Board of Commissioners of Shell-Fisheries; *provided*, that before such license is granted, said applicant shall prove to the satisfaction of said Shell-Fish Warden, that he has been a resident of this State for one year next preceding the date of said application, and that no person who has not been a resident of this State for one year prior thereto is employed by him or engaged upon said boat or vessel. Said Shell-Fish Warden shall keep a record of said applications and licenses, with the number of said boats or vessels, which number he shall furnish to said applicant upon the granting of a license; and said number shall be painted in a conspicuous manner, and as prescribed by said Shell-Fish Warden, upon each side of the bow of such boat or vessel while engaged in said work.

Sec. 4. Any person using any boat or vessel in violation of any of the provisions of this Act, or who shall use, in said Housatonic River, any number not furnished by said Shell-Fish Warden for said boat or vessel, shall be liable to a fine of ten dollars for each day that said boat or vessel shall be so used, and any person violating the provisions of this Act, so far as the same apply to the Housatonic River, may be prosecuted in the Town of Stratford, and upon conviction his license shall be revoked, and he shall be disqualified from receiving a license for the remainder of the period for which said license was granted.

Sec. 5. Nothing in this Act shall be construed as applying to any boat or vessel while used upon private oyster grounds, or as affecting the jurisdiction of courts under existing laws.

Sec. 6. Any boat or vessel illegally used by any person for taking any oysters or shells from the natural beds within the exclusive jurisdition of the State, or in the Housatonic River, shall be liable to seizure under the penalties provided in Section 2400 of the General Statutes, and such seizures may be made either within the town where the offense is committed, or wherever, within this State, said boat or vessel may be found, within one year after the commission of the offense.

SEC. 7. The provisions of this Act shall not be so construed as to affect the right to construct or dig channels, as provided for in Chapter CXXVIII of the Public Acts of 1889, or to prevent the taking of clams from any of the waters of this State.

SEC. 8. This Act shall take effect from its passage.

Approved, April 18th, 1895.

Under the above Act, Mr. Wilbur E. Hine was appointed a Shell-Fish Warden for the Town of Stratford, by the Commissioners, and duly qualified and entered upon the duties of his office and is discharging the same, under the law, in a satisfactory manner. There was at first some question of authority between this official and the Inspector of Natural Oyster Beds, but that has been properly adjusted, and the two work with a clearly defined understanding of their several duties.

OYSTER POLICE.

At the instance of the Special Committee of the Oyster Growers' Association of Connecticut, with the approval of the Commission, and after long discussion and deliberation, the following bill was passed:—

CHAPTER CIV.

AN ACT CONCERNING OYSTER POLICE.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. The Shell-Fish Commissioners shall appoint and employ five or more persons to act as Oyster Police, who shall detect and prosecute any violations of the Statutes relating to shell-fisheries upon the private oyster grounds in this State. Said Commissioners shall also hire or charter such boats or vessels as may be necessary for the use of such Police.

SEC. 2. Such Police shall have the same powers as Deputy Sheriffs or Constables with reference to such offenses, may seize any boat or vessel which has become liable to seizure under existing Statutes, and do any other acts in enforcement of the Statutes relating to shell-fisheries as may be directed by the Shell-Fish Commissioners.

SEC. 3. The Shell-Fish Commissioners shall pay to such Oyster

Police such compensation as said Commissioners may deem just and reasonable, but not exceeding the sum of three dollars per day to each person, and the total expenditure for such compensation shall not, in any one year, exceed one-third the taxes upon oyster grounds paid by the oyster growers to the State in the preceding year.

Sec. 4. Section 2335 of the General Statutes is hereby amended by striking out the words "one per cent." in line eight, and inserting in lieu thereof the words "one and one half per cent."

Sec. 5. This Act shall take effect from its passage.

Approved, April 25th, 1895.

As this bill is for the benefit of the oyster planters, was designed by them and passed at their request, it has been the opinion of the Commission that their idea as to the best utilization of the means of protection which it affords them should be followed out as closely as possible. At the time of the passage of the bill the tax for that year, 1894, had been laid and no money could be available for use under the law until the laying and collecting of the tax for 1895. The law calls for the addition of fifty per cent. to the tax rate and the addition will be made this year. After it shall have been ascertained how much money will be available from this source, it will be possible to formulate some plan for its utilization to secure the best results and to that end the Commission will confer with the Oyster Growers, among whom meetings have already been held for considering the matter and mapping out some general plan.

In a business like that of the cultivation of oysters in deep sea waters, the contingencies are great, and it is hardly to be compared with any other on that account. While under favorable conditions the results may be very gratifying, the chances of failure are many and the issue scarcely ever sure. The addition of fifty per cent. to the tax rate of such a business makes a heavy charge upon it, which should receive some adequate return and the matter requires, and will receive, careful consideration.

INSPECTOR OF NATURAL OYSTER BEDS.

CHAPTER CXI.

AN ACT CONCERNING NATURAL OYSTER BEDS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. The Board of Commissioners of Shell-Fisheries shall, annually, appoint some person to be Inspector of Natural Oyster Beds, who shall hold office until his successor is appointed and qualified.

SEC. 2. It shall be the duty of said Inspector to detect and prosecute offenses against the shell-fishery laws relating to the natural oyster beds within the exclusive jurisdiction of the State and to the Housatonic River, and for such purpose he shall have the power to go upon any boat or vessel that is being employed upon said beds, or in said river, and may examine any dredges, tongs, or other tools or machinery used thereon, and he shall have the same power as other officers to arrest for violation of said laws, and shall be entitled to the same fees as other officers for making such arrests, in addition to the compensation hereinafter provided.

SEC. 3. Prosecutions may be brought for any violation of said shell-fishery laws, in the same manner as is now provided, and the provisions of this Act shall not he construed to affect the powers of other officers to make arrests for any violation of said laws.

SEC. 4. Any boat or vessel illegally used by any person, upon the natural oyster beds of the State or in the Housatonic River shall be liable to seizure under the penalties provided in Section 2400 of the General Statutes, and such seizure may be made by said Inspector of Natural Oyster Beds, either within the town where the offense is committed, or wherever within this State said boat or vessel may be found, within one year after the commission of the offense.

SEC. 5. It shall be the duty of said Inspector of Natural Oyster Beds to report to the Board of Commissioners of Shell-Fisheries the failure of any person to comply with the provisions of Chapter CLXXI of the Public Acts of 1893, and upon the conviction of any person of the offense of dredging upon the natural oyster beds within said jurisdiction, without a license therefor as therein provided, such person so convicted shall be disqualified from receiving a license to gather oysters from said natural oyster beds within the exclusive jurisdiction of the State, for the remainder of the year for which a license might have been granted, and upon the conviction of any person to whom a license was granted, of any violation of the provisions of said Chapter, the license so granted to him shall be revoked. Said Inspector of Natural Oyster Beds shall also report to the Board of Commissioners of Shell-Fisheries any displacement of the buoys provided for in Chapter CX of the Public Acts of 1893.

Sec. 6. Said Inspector of Natural Oyster Beds shall be paid a salary of four hundred dollars per annum, by the Board of Commissioners of Shell-Fisheries, or a proportionate amount thereof for such period as he shall hold said office, and said Board of Commissioners of Shell-Fisheries may remove him for cause, and appoint his successor for the remainder of said term.

Sec. 7. Said Inspector of Natural Oyster Beds, shall, at his own expense, maintain a suitable boat or vessel to be used in the discharge of the duties herein imposed, and he shall at all times, during such period of the year as said Board may prescribe, have said boat or vessel in readiness to investigate any alleged violation of said laws.

Sec. 8. This Act shall take effect from its passage.

Approved, May 1, 1895.

Under the above Statute, the Commissioners appointed Mr. William A. Lewis, Inspector, who duly qualified, and has since been discharging his duties in a satisfactory manner. The very fact that a State officer, clothed with the power to make a search or arrest, was upon the grounds, has diminished a large proportion of the troubles heretofore complained of, and the prompt action of the officer in the few cases of transgression of the law which have been brought to his notice, has had a most salutary effect. The fleet working upon the natural oyster beds has been large, but the complaints of the violation of law are few compared with those of previous years and the law appears to be operating very favorably. In this connection, it is well perhaps to state that a perusal of the Statute should satisfy any oyster planter, we think, that it is not the duty of the Inspector of Natural Oyster Beds to watch private grounds, but that the maintenance of their buoys and the guarding of their property, adjacent to the natural oyster beds, still falls upon the owners thereof.

NON-PAYMENT OF TAXES.

For a long time the books of the Commission have been encumbered with accounts which it was impossible to settle without the tedious and expensive process of the law, and the following Statute was enacted to apply to that condition of affairs:—

CHAPTER CL.

AN ACT CONCERNING REVERSION OF OYSTER GROUNDS TO THE STATE.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. When the taxes on any oyster grounds, within the exclusive jurisdiction of the State and under the control of the Shell-Fish Commissioners, shall be in arrears for five consecutive years, it shall be the duty of the Clerk of Shell-Fisheries to notify the owner or owners of said grounds, or their legal representatives, of the fact of said arrears, and if, within three months after the date of said notification, all arrears of taxes on said grounds are not paid, said grounds shall revert to the State; and it shall be the further duty of the Clerk of Shell-Fisheries, upon the reversion of said grounds to the State, to make out a certificate of the fact of such reversion for record upon the books of the Commission, and said grounds shall thereupon be open for application, like all other unsold oyster grounds within the exclusive jurisdiction of the State.

SEC. 2. This Act shall take effect from its passage.

Approved, May 23, 1895.

Already this law has, through the notifications sent out, operated to secure the settling of several cases without cost to the State, and will, we trust, finally clear off the existing delinquent list.

The next two Acts explain themselves:

CHAPTER CLXXVII.

AN ACT RELATING TO THE TAKING OF OYSTERS IN THE EAST RIVER.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 2410 of the General Statutes is hereby repealed.

Approved, June 4, 1895.

CHAPTER CXCVI.

AN ACT CONCERNING THE SEIZURE OF VESSELS ILLEGALLY USED IN TAKING SHELL–FISH.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. Chapter XCIV of the Public Acts of 1893 is hereby amended by erasing the last sentence thereof and inserting in lieu thereof the following: If such property be found not to have been illegally used in dredging, or said cause for any reason be dismissed or withdrawn, then all costs and charges which said authority may allow shall be paid to the owner by the person making said seizure, and such person may, at any time during the pendency of said cause, be required by said authority to enter into a sufficient recognizance to said owner, with surety, conditioned for such payment in said event. The authority before which any such cause is pending shall order the release of the property seized, upon the filling of a sufficient bond to the person making the seizure, with surety, conditioned for the return of said property on demand, if the same shall finally be ordered sold.

Sec. 2. This Act shall take effect from its passage and shall affect all proceedings now pending, except that no person shall thereby be made liable for costs hitherto occasioned, for which he would not otherwise be liable; nor shall any person be thereby deprived of such right, if any, as he may now have to costs or charges already incurred.

Approved, June 20, 1895.

BUOYING THE NATURAL OYSTER BEDS.

CHAPTER CCXXV.

AN ACT CONCERNING THE NATURAL OYSTER BEDS OF THE STATE.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. Chapter CX of the Public Acts of 1893 is hereby amended to read as follows: The Shell-Fish Commissioners shall cause those natural or public oyster beds in the exclusive jurisdiction of this State known as the Stratford Bed, the Fish Island and Roton Point Beds, the Bridgeport Bed, and the Fairfield Bed, to be marked by buoys which shall be known as State Buoys, and by range monuments on the shore by which the lines can be relocated should any buoys be removed, and shall cause double buoys or a distinctive mark to be placed at any point on the boundary where the lines change in direction, and said buoys shall be maintained by the State. No buoys shall be so set in lines so run as to include within the natural or public beds any private or designated grounds.

Sec. 2. Any person injuring or removing such range monuments, or displacing such State Buoys, shall be fined not more than fifty dollars, or imprisoned not more than thirty days, or both.

Sec. 3. After the first day of January, 1894, the Shell-Fish Commissioners shall not expend during any one year, under the provisions of this Act, a sum exceeding one-half the amount received for licenses to work on the natural or public beds of the State during the year preceding.

Approved, June 26, 1895.

In the original draft of the bill calling for the buoying of the natural oyster beds the Fairfield Bed was included, but in the law as printed finally it had in some way, mysteriously disappeared. The above Act restores it to the list of natural oyster beds to be buoyed and the Commissioners have included it in their work this year. That the public may gain a more clear idea of the extent of the lines which this law requires the Commissioners to keep up, we have issued a set of maps drawn by Mr. D. C. Sanford, engineer, which give an accurate and sufficiently plain showing of the beds in question. It will be seen that the territory covered is quite extensive and when it is taken into consideration that the appropriation for this work is limited by law to one half the sum received for licenses to work upon the natural beds, it will also be seen that the means are very small. In fact to keep these boundaries properly marked the Commission should have a much larger sum at its disposal than comes from the source above named, and this will be all the more apparent when we state that the eastern line of the great Stratford and Bridgeport Natural Bed has been buoyed by the State three times since August last, and that the call is now to have it buoyed again. To be sure this line is unusually exposed and the buoys are subject to accidents which are less likely elsewhere, but to insure a proper line of reasonably permanent buoys on all the natural beds, the appropriation needs to be very largely increased.

The following details of the work show what has been done thus far:—

BUOYS SET ON THE NATURAL OYSTER BEDS DURING THE YEAR.

November 12th, 1894.

36 Buoys were set on the Stratford and Bridgeport Beds.

May 24th, 1895.

18 Buoys, on the Stratford and Bridgeport Beds.

May 25th, 1895.

46 Buoys, on the Stratford and Bridgeport Beds.

June 7th, 1895.

4 Buoys, on the Stratford and Bridgeport Beds.

June 7th, 1895.

20 Buoys, on the Fairfield Bed.

September 9th, 1895.

14 Buoys, on Stratford and Bridgeport Beds.

October 16th, 1895.

20 Buoys, on the Fish Island and Roton Point Beds.

October 17th, 1895.

20 Buoys, on the Stratford and Bridgeport Beds.

November 4th, 1895.

25 Buoys, on the Stratford and Bridgeport Beds.

Making a total of 203 Buoys set for the year.

To Buoy the Beds once would require as follows:

To Buoy Stratford and Bridgeport Beds	70	Buoys
" " Fairfield and Fairfield Bar	30	"
" " Fish Island and Roton Point	35	"
	135	"

The Oystermen who keep their grounds well buoyed, count on setting buoys up twice a year, if not in the track of vessels, which is not the case in the Stratford and Bridgeport beds and part of Roton Point and Fish Island. Fairfield and Fairfield Bar have no trouble, as a rule.

Parts of the Stratford and Bridgeport beds have been buoyed up, one day, and the following day from 8 to 12 buoys have been broken off by steamers and tug boats. It has been suggested that the State use better and larger buoys. Better buoys would not last any longer, and for size, the United States Government has limited the size. We would not recommend the State to experiment with buoys. Some of our very best Oyster Growers have been experimenting for years and have settled down to the same kind as those the State has used since it commenced to buoy the Natural Oyster Beds.

YOUNG OYSTERS FROM NATURAL BEDS.

The catch of young oysters from the natural beds that have been buoyed by the State for the last year reaches about 1,100,000 bushels, and there is fair prospect for a large catch in the spring. There has been no storm and the bottom is so firm and well set that at this late season of the year, it would require an unusually hard storm to injure the young oysters, which are well budded into the sand. The three natural beds have given employment on an average to 200 boats with an average of 3 men to a boat, for 3 months, in the Fall and Winter.

The three following Statutes explain themselves:

CHAPTER CCXLVII.

AN ACT CONCERNING THE SHELL FISH COMMISSIONERS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. Chapter LXXXI and Chapter CXI of the Public Acts passed at the present session of the General Assembly are hereby amended by striking out the words "Board of Commissioners of Shell-Fisheries," wherever said words occur in said Chapters, and inserting in lieu thereof the words Shell Fish Commissioners.

CHAPTER CCLXII.

AN ACT CONCERNING LICENSES FOR OYSTER BOATS AND VESSELS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Chapter CLXXI of the Public Acts of 1893 is hereby amended by adding to the second section thereof the following words: Any license granted to any person who, during the period for which said license is granted, removes from the State, shall be revoked.

Approved, June 29, 1895.

CHAPTER CCLXX.

AN ACT CONCERNING DUMPING MATERIAL ON PRIVATE OYSTER BEDS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. All persons desiring to dump material on the private oyster beds of the State, from bottom or side dumping scows, shall first make application to the Shell-Fish Commissioners, designating the material and the location where it is proposed to dump the same, and it shall be the duty of said Commissioners so notify adjoining owners, that they may protest, if material or place is not suitable.

SEC. 2. Any person violating the provisions of this Act shall be fined not more than fifty nor less than seven dollars for each offense.

Approved, July 1, 1895.

THE COMMISSIONERS MADE ASSESSORS.

CHAPTER CCXCI.

AN ACT CONCERNING THE SHELL-FISH COMMISSIONERS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. Section one of Chapter CC of the Public Acts of 1889 is hereby amended by inserting in the eighth line thereof after the word "years," the words "or until their successors are appointed and qualified; and any vacancy occurring in said Board for any cause may be filled by the Governor for the unexpired term."

SEC. 2. Section three of Chapter CC of the Public Acts of 1889 is hereby repealed and the following inserted in its place: The Shell-Fish Commissioners shall appoint a clerk, who shall be designated as Clerk of Shell-Fisheries, and shall hold office during the pleasure of said Commissioners; he shall receive, as compensation for his services, fourteen hundred dollars per annum in monthly installments. Said Commissioners shall make an assessment on all oyster grounds for taxation.

Approved, July 3, 1895.

While the members of the Commission might deem it a compliment to their fairness and impartiality that they were thought competent to properly review their own assessments, yet the theoretical inconsistency of the dual duty leads them to wish that some other body had been assigned to the one function or the other. They do not desire to shirk the labor, but they would prefer to bring to the duties of a board of review minds free from any prejudice, however unconscious, inseperable from a previous knowledge and consideration of the cases before them.

CHAPTER CCCXLIV.

AN ACT AMENDING AN ACT CONCERNING SHELL-FISHERIES.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. Chapter CCXCI, entitled: An Act concerning Shell-

Fisheries, passed at the present session of the General Assembly, is hereby amended by adding thereto the following as Section three. This Act shall take effect from its passage.

Sec. 2. This Act shall take effect from its passage.

Approved, July 9, 1895.

LANDMARKS.

During the past year the Commissioners have replaced several important landmarks in a permanent and substantial manner. The value of these landmarks to the oystermen is great, and the State makes no more judicious investment for the benefit of the business than in these, when they are rightly constructed and properly attended to. In this connection the Commissioners would suggest that could the natural beds be permanently monumented on shore so that ranges could be easily secured, the labor and cost of keeping them properly buoyed would be greatly reduced. This would entail considerable expense at first, but it would be compensated by subsequent results.

DANBURY FAIR.

Previous to the opening of the great Columbian Exposition at Chicago there was a meeting in that city of the Fish Commissioners of all the States in the Union, and the Shell Fish Commission of Connecticut was represented there by one of its members. A small collection of articles, representing the Oyster industry, was gotten together by Mr. D. C. Sanford, for the Commission, and taken to the meeting. It awakened a profound interest and the Commission heard from it repeatedly. Believing that a somewhat similar feeling might exist among the people of this State and that a more intimate knowledge of the practical side of the Oyster business would be mutually beneficial to the public and the planters, it was determined to make an exhibit similar to the one taken to Chicago, at the Danbury Fair, in October last. There being no State Fair this year that at Danbury seemed to more nearly answer the requirements than any other. Mr. D. C. Sanford, engineer, assisted by Mr. Frederick Botsford, Clerk of Shell Fisheries, and Mr. G. W. Hallock, Commissioner, of Danbury, managed the affair which was a most gratifying success, and at a very slight expense created a great amount of interest and inquiry as to the business.

LIST OF EXHIBITS.

The following list of exhibits shown will give a fair idea of the collection:

LIST OF THE EXHIBITS AT DANBURY FAIR.

Oyster Set,	1 week old.
Oyster Set,	2 “ “
Oyster Set,	4 “ “
Oyster Set,	2 months old.
Oyster Set,	4 “ “
Oyster Set,	6 “ “
Oyster,	1 Year Old, Both Hard and Soft Bottom.
Oyster,	2 “ “ “ “ “ “ “
Oyster,	3 “ “ “ “ “ “ “
Oyster,	4 “ “ “ “ “ “ “
Oyster,	5 “ “ “ “ “ “ “
Oyster,	8 “ “ “ “ “ “ “
Oyster,	12 “ “ “ “ “ “ “

ENEMIES OF THE OYSTER.

Star Fish,	1 month old.
Star Fish,	2 “ “
Star Fish,	6 “ “
Star Fish,	1 year old.
Star Fish,	2 “ “
Star Fish,	3 “ “
Star Fish,	4 “ “
Star Fish,	5 “ “

WINKLES.

Winkles,	6 months old.
Winkles,	1 year old.
Winkles,	2 “ “
Winkles,	3 “ “
Winkles,	4 “ “
Winkles' Spawn.	

DRILLS.

Drills, (6)	6 months old.
Drills,	1 year old.

Star Fish in the act of killing the Oyster.

Oyster Shells, showing the hole made by the Drill.

Oyster Shells, showing the work of the Star Fish after the Oyster had been eaten.

Material of all kinds upon which young Oysters had set, such as Wood, Tin, Iron, Rubber, Stone, Glass, Rock Weed, Cloth, Rope, and China.

Two models of Oyster Steamers—one with the capacity to carry 1,000 bushels of Oysters, and one with the capacity to carry 2,300 bushels of Oysters.

THE BUSINESS.

Your Commissioners would call especial attention to the table of the amounts of material used this year in the cultivation of oysters. A careful perusal of the aggregates of that showing will convince any intelligent reader of the vast importance of the business and the large capital involved therein. With this table, those showing the holders of oyster grounds and also the list of steamers in use, should be taken in order to reasonably estimate the business. This year there was a most abundant "set" throughout the eastern section of the oyster territory and while the usual accompaniment of an increased number of star-fish makes the "eternal vigilance" which is the price of a successful oyster crop, only the more imperative, the prospect is good. The "scares" which tended at one time to depress the value of Connecticut shore oysters have all passed away, and the demand upon the Connecticut stock is as good as the state of general business would warrant. It is probable that the totals of the business done this year are quite equal to those of last, and that placing the value of the annual catch from private beds, at $1,500,000, is not an overestimate.

GEORGE C. WALDO,
CHRISTIAN SWARTZ,
G. W. HALLOCK,
Shell Fish Commissioners.

Financial Statement.

OF THE SHELL-FISH COMMISSIONERS FOR THE YEAR ENDING SEPTEMBER 30TH, 1895.

RECEIPTS.

Total amount received,		$6,862 75
For deeds delivered,	$424 60	
For drawing and recording deeds,	53 60	
For taxes collected,	5,689 05	
For boat licenses	695 50	
		$6,862 75

DISBURSEMENTS.

For office rent and supplies,	$479 43	
For engineer,	250 00	
For preservation of landmarks,	95 85	
For inspection of mud dumping,	205 00	
For buoying natural oyster beds	390 85	
For canvas printing, &c., boat licenses	29 80	
For inspection of natural oyster beds,	100 00	
For pay and expenses of commissioners	2,735 00	
For salary of clerk,	1,500 00	
For auditors,	60 00	
		$5,845 93

SUMMARY.

Receipts for year ending Sept. 30th, 1895,	$6,862 75
Disbursements " " " "	5,845 93
Excess of Receipts,	$1.016 82

Licenses.

RECEIPTS AND DISBURSEMENTS ON NATURAL OYSTER BED ACCOUNT FROM SEPTEMBER 30, 1894 TO SEPTEMBER 30, 1895.

RECEIPTS.

For Boat Licenses,		$695 50

DISBURSEMENTS.

For engineer,	$78 20	
For steamers,	185 29	
For paints, buoys, stone, &c.,	127 36	
For canvas, members' stationery, &c.,	29 80	
		$420 65
Excess of receipts over disbursements,		$274 85

LIST OF OYSTER STEAMERS USED IN CONNECTICUT WATERS, 1894–5.

NAME.	TONNAGE.		CAPACITY.	OWNER.	LOCALITY.
	GROSS.	NET.	BUSHELS.		
H. S. Lockwood	69.50	34.75	1,000	C. F. Lockwood	Greenwich.
Ithiel	31.93	15.97	800	Chas. E. Palmer	Greenwich.
Susie	....	....	100	W. A. Cumming	Stamford.
Ripple	36.30	18.10	900	D. B. Decker	Norwalk.
Adeline	20.07	7.33	300	S. B. Reed	Norwalk.
J. Howard Lowndes	72.07	36.84	1,500	S. H. Lowndes	Norwalk.
Waneta	19.89	9.95	500	Gould Hoyt	Norwalk.
Cereus	16.57	8.29	400	C. W. Raymond	
Addie V	21.27	11.88	500	William Verity	Norwalk.
Laurel	....	....	400	A. Solomons	Norwalk.
Edith A	30.00	15.50	400	Joseph and Charles Vroom	Norwalk.
Freddie W. Decker	20.00	14.36	800	Peter Decker	Norwalk.
Wm. H. Hoyt	91.02	45.51	2,000	Wm. H. Hoyt & Son	Norwalk.
Jessie Clayton	56.23	28.17	1,200	Chas. Lowndes	Norwalk.
C. B. Lowndes	28.43	14.22	1,400	C. T. Lowndes	Norwalk.
Henry J.	42.42	26.96	1,200	T. S. Lowndes	Norwalk.
Flora	20.49	10.25	500	A. D. Corson	Norwalk.
Mabel Stevens	31.74	21.12	1,200	W. I. Stevens	Norwalk.
Kate C. Stevens	104.65	52.33	2,500	W. I. Stevens	Norwalk.
Medea	54.02	27.01	1,000	H. Rowland	Norwalk.
Etta May	99.55	49.78	1,300	May Oyster Co.	Bridgeport.
Josephine	85.89	42.95	2,000	Craw & L'Hommedieu	Norwalk.
F. C. & A. E. Rowland	55.78	26.82	1,000	D. K. Cole	Norwalk.
D. K. Cole	31.87	15.94	300	Sand Selleck	Norwalk.
Carrie	....	....	200	Geo. N. Warren	Norwalk.

LIST OF OYSTER STEAMERS USED IN CONNECTICUT WATERS, 1894–5.

Name.	Tonnage.		Capacity.	Owner.	Locality.
	Gross.	Net.	Bushels.		
Molly	29.36	19.44	200	C. W. Bell	Norwalk.
Alberta	23.78	13.28	500	B. Frank and Chas. F. Howell	Norwalk.
Daisy	....	5.61	300	Nassau Oyster Co	Southport.
Ostrea	97.99	70.60	1,500	M. E. Morris	Bridgeport.
Star Fish	18.08	9.04	300	M. E. Morris	Bridgeport.
Bond & Currier	94.86	66.63	1,400	Clark & Bond	Bridgeport.
Florence	84.86	64.60	1,200	Henry J. Lewis	Bridgeport.
C. S. Conklin	52.96	34.15	950	Henry J. Lewis	Bridgeport.
Virginia	83.10	46.50	1,000	Henry J. Lewis	Bridgeport.
Precurser	69.66	34.83	1,000	Pher F. West	Bridgeport.
Dreadnaught	71.83	48.56	800	Pher F. West	Bridgeport.
Active	59.74	40.09	900	Pher F. West	Bridgeport.
Flash	6.00	4.00	300	Frank Hitchcock	Bridgeport.
W. M. Merwin	64.21	35.14	1,000	W. M. Merwin & Sons	Milford.
W. A. Cumming	76.17	40.84	1,100	W. M. Merwin & Sons	Milford.
Spark	22.15	10.08	200	C. D. Parmelee	New Haven.
Pioneer	44.37	24.19	400	Ludington & Palmer	New Haven.
Luzerne Ludington	74.27	37.14	1,000	Ludington & Palmer	New Haven.
W. H. Lockwood	48.94	29.71	1,000	H. C. Rowe & Co	New Haven.
Gordon Rowe	57.99	29.00	1,000	H. C. Rowe & Co	New Haven.
Ruel Rowe	147.85	73.93	2,400	H. C. Rowe & Co	New Haven.
Mikado	76.92	51.33	900	J. Smith & Son's	New Haven.
Daisy E. Smith	61.68	30.84	1,200	J. Smith & Son's	New Haven.
Jeremiah Smith	113.38	66.28	2,300	J. Smith & Son's	New Haven.
Enterprise	34.00	20.65	800	Hulse & Dunbar and Lancraft Bros.	New Haven.

LIST OF OYSTER STEAMERS USED IN CONNECTICUT WATERS, 1894–5.

Name.	Tonnage.		Capacity.	Owner.	Locality.
	Gross.	Net.	Bushels.		
Isaac E. Brown	85.68	56.17	1,400	I. E. Brown	New Haven.
Ivernia	13.36	6.68	900	J. E. Bishop & Co	New Haven.
James Morgan	35.99	27.80	900	American Oyster Co	New Haven.
Emily Mansfield	66.28	47.82	1,200	F. Mansfield & Sons	New Haven.
J. & G. H. Smith	42.53	21.26	800	G. H. Smith	New Haven.
J. & P. Thomas	79.02	48.48	1,500	Thomas Thomas	New Haven.
Smith Brothers	64.74	48.74	1,600	Smith Bros	New Haven.
Amanda	74.53	37.27	1,300	Lancraft Brothers	New Haven.
Richard W. Law	113.62	56.81	2,000	Richard W. Law	New Haven.
H. A. Barnes	64.82	43.34	1,500	Barnes & Lane	New Haven.
Pansie	10.80	10.00	400	Stoney Creek Oyster Co	Stoney Creek.
Jennie			300	G. M. Long & Co	New London.
M. Dewing	71.47	51.47	1,000	M. Dewing	Providence.
Kittie			350	T. H. Buftham	New York.
Falcon			700	J. & J. W. Ellsworth	New York
Lizzie E. Woodward			1,000	Van Name Bros	New York.
J. W. Boyle			1,000	J. W. Boyle	New York.
J. P. Mesereau			1,500	Daniel Burbank	New York.
Lizzie H.			1,600	Jacob I. Housman	New York.
Mystery			2,000	D. K. Cole	New York.
Harry			2,500	Peter Androvette	New York.
Daisy			400	Mott & Schaffer	New York.

Alphabetical List of Owners of Oyster Ground

WITHIN THE JURISDICTION OF THE STATE, WITH THE NUMBER OF ACRES OWNED BY EACH, AS SHOWN BY THE BOOKS OF THE SHELL FISH COMMISSION ON NOVEMBER 1, 1893, THE DATE OF THE LAST COMPLETED TAX LIST.

NAME.	TOWN.	ACRES.
Alling, H. M. & W. E	New Haven	210.
American Oyster Co	New Haven	991.7
Atwood & Higgins	Boston, Mass	200.
Atwood, H. K	Boston, Mass	349.4
Armstrong, C. H	Bridgeport	52.9
Armstrong, D. N	Bridgeport	48.2
Arsant, Franceline	Greenwich	10.
Averill, R. G	Branford	50.
Backus, Harley C	New Haven	200.
Ball, Ernest E	New Haven	3.50
Banks, Mark	Greenwich	2.
Barmore, H. W	Greenwich	17.
Barnes & Lane	New Haven	733.
Barnes, Wm. S	New Haven	101.2
Beardsley & Higby	Milford	800.
Beardsley, A. J. & Son	Bridgeport	267.
Beardsley, F. J	Stratford	93.5
Beardsley, Frederick S	Stratford	317.
Beers, Hon. A. B	Bridgeport	174.3
Bell, Chas. W	Norwalk	425.
Bell, Hiram, Estate	Norwalk	10.
Bell & White	Norwalk	120.
Benedict, Thos. E	New Haven	270.
Bills, Henry	New Haven	17.4
Bohner, J. J	Brooklyn, N. Y	40.
Bond & Clark	Bridgeport	500.2
Bradley, I. L. & J. L.	New Haven	12.
Bradley & Platt	Orange	47.5
Brooks, T. D. & B. S	Danbury	50.6
Brooks, Wm. T	Norwalk	35.
Brown & Houche	Groton	19.5
Brown, Isaac E	New Haven	565.9
Brown, James N	Guilford	21.7
Brown & Halverson	Bridgeport	151.6
	Carried forward	7,253.6

NAME.	TOWN.	ACRES.
	Brought forward..	7,253 6
Brundage, J. C	Greenwich	8.
Bryan, Wm.	Branford	100.
Bunnell, Chas. W	New Haven	40.0
Burnell, Merritt W	New Haven	570.3
Burr & Knapp	Bridgeport	103.3
Butler, Herbert M.	Auburn, R. I.	65.2
Byxbee, Silas B.	Norwalk	34.
Byxbee, Samuel, Estate	Norwalk	10.
Cadmus, John	Woodhaven, L. I.	46.3
Callahan, Eugene A	New Haven	10.2
Case, Elmer E	Norwalk	45.6
Case, Wm. H	Norwalk	10.
Chard, Samuel	Greenwich	197.
Chard, David B., Estate,	Greenwich	28 4
Chipman, S. & D.	New Haven	150.
Clark, Theo	Greenwich	42.
Cook, Oliver	Norwalk	205.
Cole, Hickson, W	Norwalk	28.7
Collinge, John, Estate	Greenwich	16.
Craw & L'Hommedieu	Norwalk	1,810.3
Crockett, Alfred S.	Norwalk	2.
Crockett, Julia L.	Norwalk	12.1
Cumming, Thomas	Stamford	36.2
Cumming, Wm. A. & Thos	Stamford	493.5
Cumming, William A.	Stamford	249.9
Daley, John	Westport	87.7
Dayton, Geo. W	New Haven	101 8
Dayton, John	Greenwich	2.
Dayton, John & Sons	Greenwich	438.1
Davis, Chas. W.	Portchester	7.7
Davis, Geo. N	Norwalk	6.
Decker, Abraham	Norwalk	156.
Decker, David B	Norwalk	68.7
Decker & Raymond	Norwalk	204.4
Decker, John	Stamford	10.
Decker, Josephine J	Norwalk	44.4
Decker, Manning	Norwalk	12.
Decker, Peter D	Norwalk	320.
Decker, Sylvester P	Norwalk	146.
Delano, John L	Portchester	3.
Delano, Thos. H	New York	24.
DeWaters, John H	Norwalk	121.6
DeWaters & Stevens	Norwalk	154.
	Carried forward...	13,474.

NAME.	TOWN.	ACRES.
	Brought forward...	13,474.
Dening, Martin	Milford	300.
Dibble, Alphonso	Norwalk	115.8
Dibble, R. B	Norwalk	2.
Dibble, Stephen E	Norwalk	10.
Dorman, B. L	Greenwich	6.
Eaton, Chas. N	New Haven	125.1
Elley, Janet	New Haven	89.
Ellsworth, J. & J. W	New York	403.1
Farwell, Geo	Portchester	4.
Farwell. James	Portchester	19.1
Farwell, John	Portchester	18.
Ferris, Geo. W	Greenwich	10.
Finiels, Louis	Greenwich	72.3
Fitch, Henry R	Norwalk	28.
Forbes, C. B	Guilford	24.
Ford, Adolphus I	Greenwich	25.
Ford & Ryle	Stamford	78.7
Ford, Claudia M	Greenwich	25.
Ford, Elbert L	Milford	164.
Ford & Swan	Bridgeport	103.3
Fordham, H. & Son	Greenport, L. I	118.
Fordham & Bell	Southington	100.
Fordham, Henry C	Stratford	50.
Fowler, John W	Milford	400.
Franklin, Delos I	New York	500.
Franklin, Zelus E., Estate	Milford	100.
Frisbie, Nelson	New Haven	100.
Gager, Hans	Norwalk	10.
Galott, Geo. F	Fairfield	103.3
Garry, Mary O	Stratford	47.
Geib, A. A. & H. P	Norwalk	344.
Glahn, Miss Anna W., Von	New Haven	34 3
Godfrey, E. W	Norwalk	33.4
Godfrey, William	Norwalk	46.
Goodsell, Miller & Lewis	Bridgeport	317.7
Grindle, Richard H	New Haven	245.
Guilford Oyster Co	Boston	822.8
Hamilton, A. E	New Haven	33.
Hamilton, Geo. C	New Haven	155.
Hart & Raymond	Norwalk	15.5
Hassan, E. J	East Haven	13.5
Heath, Andrew	Norwalk	38.
Hilton, H. R	Norwalk	40.
	Carried forward...	18,962.9

NAME.	TOWN.	ACRES.
	Brought forward...	18,962.9
Hollins & Ott	Norwalk	26.9
Holly, Newman	Portchester	38.
Hopkins, C. F	Greenwich	4.
Hopkins, Judson W	Greenwich	20.
Hotchkiss, W. T	New York	73.
Howell, B. Frank	Norwalk	51.6
Hoyt, Chas. W. & Son	Bridgeport	440.
Hoyt, Gould	Norwalk	24.
Hoyt, W. F	Norwalk	29.7
Hoyt, Wm. H. & Son	Norwalk	890.9
Huested, G. F., Estate	Greenwich	50.
Huested, J. E	Greenwich	5.
Huested, P. B	Camden, N. J	10.
Hull, Chas. P., Estate	Minneapolis	105.8
Hulse & Dunbar	New Haven	124.9
Hulse, Wm. C	Norwalk	43.7
Hurd, Chas. A	Bridgeport	86.6
Hynard & Marshall	Greenwich	5.
Johnson, H. St. Clair	New Haven	107.
Jones, Thomas	New Haven,	86.
Judson & Whiting	Stratford	42.5
Lafoe, W. E	New Haven	22.4
Lancraft Bros	New Haven	1,078.9
Lane & Linsley	New Haven	60.
Lane, Fred. A	New Haven	30.
Lane, Frank T	New Haven	150.
Lane, F. T. & F. A	New Haven	108.
Law, J. H. & S. B	New Haven	165.
Law, R. W	New Haven	188.
Law, R. W., Jr	New Haven	175.
Lewis, Henry J	Stratford	8,719.3
Livearman, W. W	Darien	21.6
L'Hommedieu, J. S	Norwalk	10.
Lockwood & Hopkins	Greenwich	42.
Lockwood, Elbert F	Greenwich	974.7
Lockwood, S. B	Greenwich	8.0
Lockwood, Theron W	Greenwich	13 6
Lowndes, Charles	Norwalk	392.4
Lowndes, Chas. T	Norwalk	90.
Lowndes, John Henry	Norwalk	13.6
Lowndes, Stanley H	Norwalk	510.6
Lowndes, Theo. S	Norwalk	435.2
Ludington & Eaton	New Haven	50.
	Carried forward....	34,205.8

NAME.	TOWN.	ACRES.
	Brought forward...	34,205.8
Ludington & Palmer	New Haven	443.
Lutz, Alexander	Greenwich	16.
Mallory, Geo. W	New Haven	150.
Mallory & Ball	New Haven	365.6
Maltby, C. S., Estate	Greenwich	20.9
Mansfield, F. & Sons	New Haven	927.
Marshall, Benj	Stamford	15.
Marshall, Enoch G. & Sons	Stamford	66.5
Marshall, Wilmot & Starkins	Greenwich	95.2
Martin, Geo. W. & Son	Portchester, N. Y	91.
Martin, Henry J	Portchester, N. Y	6.3
May, Jacob	Bridgeport	55.3
May Oyster Co	Bridgeport	1,444.4
McCrodden, Rowland & Redifern	Canarsie	96.3
McGuinness	Stamford	30.4
McGuire, Estate	Portchester, N. Y	12.
McNeil Bros	New Haven	171.3
McNeil, Daniel	New Haven	40.
Mead, Daniel S., Jr., Estate	Greenwich	114.5
Mead, Samuel	Norwalk	3.1
Meeks, Mrs. Peter A	New Haven	50.
Merwin, Francis E	Norwalk	4.5
Merwin, Samuel O	New Haven	64.2
Merwin, Wm. M. & Sons	Milford	2,148.
Miller, Anderania	New Haven	117.
Miller & Day	Stratford	299.8
Mills, E. B. & Co	Fairfield	51.6
Moe, Wm. G.	Norwalk	1.5
Moore, N. W. Estate	New Haven	10.
Moore, William	Norwalk	51.
Morgan, H. P	Norwalk	5.
Morris, Julius A	New Haven	2.1
Morris, Louis S	Bridgeport	150.
Morris, Mrs. Margaret E	Bridgeport	109.
Morris, Marshall E	Bridgeport	1,219.9
Moss, Lincoln	New York	57.7
Nash, Chas. J	Black Rock	38.8
Nassau Oyster Co	Fairfield	179.
Newton, Henry G	New Haven	54.7
Newman, Chas	Greenwich	14.1
Newman, Oscar	Greenwich	10.1
Palmer, B. F	Greenwich	101.
Palmer, Chas. E	Greenwich	331.
	Carried forward....	43,848.4

NAME.	TOWN.	ACRES.
	Brought forward...	43,848.4
Palmer, Clarence E	Sound Beach	20.
Palmer, Geo. A	Greenwich	48 2
Palmer, H. Ferris	Greenwich	18.
Palmer, Joseph G , Estate	Greenwich	63.4
Palmer, M. K. & H. J	Greenwich	20.
Palmer, Ralph A	Meriden	130.
Parmelee, C. D	New Haven	787.9
Parmelee, R. H	Norwalk	16.
Paush, Albert	Hartford	88.9
Peck, D. L., Estate	Clinton	50.
Peters, Harry	Portchester	10.
Pfuderer, Chas. L., Estate	New Haven	10.5
Plander, John H	Norwalk	2.
Post, G. E. & A. D.	Keyport, N. J	121.8
Potter, Isaac L	New Haven	36.
Prior, A. M,	Stamford	299.4
Raymond, Chas. W	Darien	129.9
Raymond, Geo. W.	Norwalk	10.
Raymond, Robert A	Darien	25.
Reynolds, W. S	Greenwich	7.9
Reed, Wm. B	Norwalk	6.
Roberts, John	Norwalk	96.
Roberts, Nathan	Norwalk	12.
Roberts, Wm. O	Norwalk	12.
Rowe, B. N. & E. C	New Haven	50.
Rowe, Henry C	New Haven	8,090.8
Rowland, W. M. & Co	New Haven	417.
Royden, Wallace N	Milford	30.
Sanford, P. G	Westport	387.
Seaman, James M	New Haven	190.6
Searles, L. W	New York	24.
Sears, Wm. H	New Haven	100.
Seeley, C. Barnum	Bridgeport	10.
Selleck, Sands	Norwalk	15.
Selleck & Webb	Norwalk	12.7
Shaffer, Geo. H	New York	106.
Shaffer & James	Brooklyn, L. I	326.1
Shepard, F. W	Branford	50.
Simmell, Francis X	Greenwich	58.
Smith Bros	Norwalk	100.
Smith & Benedict	New Haven	20.
Smith & Lane	New Haven	146.
Smith, Geo. H	New Haven	415.
	Carried forward....	56,497.5

NAME.	TOWN.	ACRES.
	Brought forward...	56,497.5
Smith, J. & Sons	New Haven	2,668.1
Smith, Mrs. Julia	New Haven	38.
Smith, S. F. & W. M	New Haven	100.
Smith, M. P. & R. T	New Haven	200.
Smith Bros	New Haven	731.
Solman, Alden	Norwalk	752.9
Stanward & Moore	Westbrook	117.
Starkins, Samuel	Greenwich	74.5
Stevens, Aaron G	Norwalk	81.3
Stevens, A. G. & G. W	Norwalk	4.
Stevens, Geo. W	Norwalk	18.
Stevens, Wm. I	Norwalk	2,056.9
Stony Creek Oyster Co	Branford	138.8
Stratford Oyster Co	Stratford	943.
Taylor, Hiram B	Norwalk	35.
Thomas, John	New Haven	6.
Thomas, Thomas	New Haven	215.
Thomes, Chas. F	Norwalk	96.
Thompson, Chas. E	New Haven	108.
Thompson & Bishop	New Haven	50.
Thompson, J. E. & Chas. E	New Haven	100.
Tomlinson, Chas A	Milford	200.
Townsend, Brown & Rowe	New Haven	98.
Townsend, Chas. H	New Haven	207.3
Townsend, Geo. H	New Haven	939.9
Traverse, H. I	Portchester	7.
Traverse, Isaac M	Portchester	31.
Turpin, Emma L	Bridgeport	294.1
Tuthill, Alva B	Norwalk	279.
Vroom, Joseph	Norwalk	69.6
Walsh, Peter Henry	Greenwich	4.1
Ward, W. W	Orange	750.
Warren & Decker	Norwalk	80.
Waterman, C. H	New York	146.6
Webb, Henry L	Norwalk	1.
Webb & Lynch	Darien	34.3
Wedmore & Barnes	New Haven	51.4
Wedmore & Rowe	New Haven	50.
Wedmore & Tuttle	New Haven	100.
Wells & Mead	Norwalk	83.3
West, P. F	Bridgeport	222.6
Westcott & Horton	Greenwich	16.
Whalley, Wm. L	Greenwich	10.
	Carried forward....	68,807.1

NAME.	TOWN.	ACRES.
	Brought forward...	68,807.1
Wheeler, Frank	Meriden	400.
White, Merrill	New Haven	135.9
Wicks & Bassett	Norwalk	8.
Wicks, Daniel P.	Norwalk	6.
Wicks, Geo. A. Hester	Norwalk	8.7
Wicks, Julia A.	Norwalk	50.
Wiggins, Floyd E.	New Haven	48.8
Williamson, Geo	Norwalk	6.
Willmott, Wm. H. & J. M	Darien	36.9
Wright, Thos.	Norwalk	103.3
	Total	69,610.7

AMOUNT OF MATERIAL PUT ON OYSTER BEDS BY PROMINENT CULTIVATORS FOR THE SET OF 1895.

CULTIVATORS.	LOCALITY.	No. Bushels Shells Planted.	No. Bushels Crushed Stone Planted.	No. Bushels Long Island Gravel Planted.	No. Bushels of Gravel and Sand Dredged and Planted.	No. Bushels of Bridgeport Natural Bed Set of 1895.	Total Number of Bushels Planted.
Henry C. Rowe	New Haven	187,000	....	....	542,574	....	729,574
Wm. M. Merwin & Sons	Milford	75,000	12,000	....	303,800	....	390,800
Isaac E. Brown	New Haven	40,000	....	....	223,076	....	263,076
J. Smith & Sons	“ “	200,000	....	....	....	....	200,000
Smith Bros	“ “	130,000	....	....	....	10,000	140,000
The May Oyster Co.	Bridgeport	75,000	....	60,000	....	....	135,000
William S. Stevens	Rowayton	79,000	21,600	2,400	....	....	103,000
Marshall E. Morris	Bridgeport	90,000	....	....	....	....	90,000
Lancraft Bros	New Haven	85,500	....	....	....	....	85,000
E. Frank Lockwood	Bay Port	70,000	....	....	....	....	70,000
F. Mansfield & Sons	New Haven	60,000	....	....	....	....	60,000
American Oyster Co.	“ “	60,000	....	....	....	....	60,000
Barnes & Lane	“ “	45,000	....	....	....	10,000	55,000
A. Solmans	So. Norwalk	10,000	....	....	....	40,000	50,000
Theo. S. Loundes	“ “	25,000	....	....	....	15,000	40,000
Craw & L'Hommedieu	Rowayton	31,935	7,106	....	....	....	39,041
Chas. E. Palmer	Sound Beach	8,000	....	22,000	8,500	....	38,500
C. D. Parmelee	New Haven	38,000	....	....	....	....	38,000
Oliver Cook	Rowayton	....	....	36,000	....	....	36,000
Stanley H. Loundes	“	15,000	....	....	....	20,000	35,000
W. M. Rowland & Co.	New Haven	35,000	....	....	....	....	35,000
Luddington & Palmer	“ “	35,000	....	....	....	....	35,000
Geo. H. Smith	“ “	32,000	....	....	....	....	32,000
Nassau Oyster Co	Fairfield	26,000	....	....	....	....	26,000
Thomas Thomas	New Haven	25,000	....	....	....	....	25,000
Stratford Oyster Co	Stratford	10,622	....	12,240	....	....	22,862
Willie M Smith & Co	New Haven	20,000	....	....	....	....	20,000
		1,509,057	40,706	132,640	1,077,950	95,000	2,855,353

AMOUNT OF MATERIAL PUT ON OYSTER BEDS BY PROMINENT CULTIVATORS.—CONTINUED.

CULTIVATORS.	LOCALITY.	No. Bushels Shells Planted.	No. Bushels Crushed Stone Planted.	No. Bushels Long Island Gravel Planted.	No. Bushels Gravel and Sand Dredged and Planted.	Bridgeport Set of 1895.	Total No. of Bushels Planted.
S. B. & John Law	New Haven	20,000	....	....	....	....	20,000
Peter Decker	So. Norwalk	11,000	8,500	....	....	....	19,500
M. W. Burwell	New Haven	16,000	1,700	....	....	....	17,700
R. W. Law,	" "	15,000	....	....	....	....	15,000
R. W. Law, Jr.	" "	15,000	....	....	....	....	15,000
Stoney Creek Oyster Co.	Stoney Creek	14,000	....	....	....	....	14,000
Clark & Bond	Bridgeport	13,000	....	....	....	....	13,000
W. A. & T. Cumming	Stamford	13,623	....	....	....	....	12,623
Lane & Linsley	New Haven	11,286	....	....	....	....	11,286
Smith & Lane	" "	11,000	....	....	....	....	11,000
J. E. Bishop & Co.	" "	10,000	....	....	....	....	10,000
Pher F. West	Bridgeport	10,000	....	....	....	....	10,000
Ernest E. Ball	New Haven	9,560	....	....	....	....	9,560
B. Frank Howell	So. Norwalk	5,500	....	2,700	....	....	7,700
Prior & Shaffer	Stamford	7,500	....	....	....	....	7,500
David B. Decker,	So. Norwalk	4,000	....	....	....	....	4,000
B. F. Palmer	Sound Beach	2,500	....	1,200	....	....	3,700
W. N. Royden	Milford	3,000	....	....	....	....	3,000
Lawson & Martinaur	So. Norwalk	3,000	....	....	....	....	3,000
DeWaters & Stevens	" "	2,000	....	....	....	....	2,000
Thomas Cumming	Stamford	1,643	....	....	....	....	1,643
Willmott Bros	Darien	1,500	....	....	....	....	1,500
F. X. Simmell	Sound Beach	1,000	....	....	....	....	1,000
Chas. Seeley	New Haven	1,000	....	....	....	....	1,000
Samuel Starkin	Greenwich	500	....	....	....	....	500
Thomas E. Benedict	New Haven	400	....	....	....	....	400
John McGuinniss	Stamford	400	....	....	....	....	400
E. F. Marshall	Stoney Point	100	....	....	....	....	100
		202,012	10,200	3,900	....	....	216,112
		1,509,057	40.706	132,640	1,077,950	95,000	2,855,353
		1,711,069	50,906	136,540	1,077,950	95,000	3,071,465

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.

Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
Amateur	1	Wm. A. Lewis	Bridgeport	Wm. A. Lewis
S. E. Smith	2	Harriet J. Nash	Bridgeport	Charles I. Nash
Valiant	3	Pher. F. West	Bridgeport	Pher. F. West
Simon Banks	4	Hart & Lee	Bridgeport	Aaron J. Hart
A. F. Beard	5	Walter Sprague	New York	Daniel Sprague
Libbie N	6	Joseph Ehlert	Bridgeport	Joseph Ehlert
Recreation	7	Walter N. Avery	New Haven	W. N. Avery
Echo	8	George D. Clark	Norwalk	George D. Clark
Mary	9	Frank I. Hitchcock	Bridgeport	Frank I. Hitchcock
Irene	10	Frank L. Mills	Bridgeport	F. L. Mills
Broadbill	11	L. B. Powe	Bridgeport	L. B. Powe
Eurge Yaunia	12	Karl Petterson	South Norwalk	Karl Petterson
Jennie W	15	Wm. Wood, Jr	Darien	Wm. Wood, Jr.
Parole	16	Samuel H. Danks	Bridgeport	Thomas Hinchey
Rescue	17	John Cihak	Bridgeport	John Cihak
Viking	18	Oliver Cook	Rowayton	Oliver Cook
Clarence	19	William M. Redfern	South Norwalk	Wm. M. Redfern
Alice	20	Robert M. Utz	Rowayton	R. M. Utz
Viola May	21	Wheeler Hawley	Bridgeport	Wheeler Hawley
Harry	22	Housatonic Oyster Co	Stratford	Samuel Wakelee
Mary Lavinia	24	John McGuinness	Stamford	John McGuinness
Shelldrake	25	Edward L. Palmer	Bridgeport	Edward L. Palmer
Lottie	26	Martin W. Knowlton	Norwalk	M. W. Knowlton
Annie Francis	27	C. D. Parmelee	New Haven	Wm. Garrett
Azellia	28	Francis E. Merwin	South Norwalk	F. E. Merwin
Rambler	29	Henry P. Raymond	South Norwalk	Charles N. Raymond
Ella May	30	Frank F. Bishop	New Haven	F. F. Bishop

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.—CONTINUED.

Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
Edna	31	Joshua R. Jennings	South Norwalk	J. R. Jennings
Elsie M	32	Wm. G. Moe	Rowayton	Wm. G. Moe
Lillian	33	Julia L. Crockett	Rowayton	Alfred S. Crockett
Lida May	34	George A. Wicks	Rowayton	George A. Wicks
Martha	35	Hans Gager	Rowayton	Hans Gager
Jessie E	36	Wm. P. Parlow	Bridgeport	William P. Parlow
Arrow	37	Charles H. Gehrmann	South Norwalk	Charles H. Gehrmann
Cora	38	Charles W. Remson	South Norwalk	Charles W. Remsen
James A. Hoyt	39	James W. Hoyt	South Norwalk	George A. Hoyt
Katydid	40	John Conklin, Sr.	East Norwalk	John Conklin, Jr.
Emma Jane	42	Samuel Chard	Greenwich	Wm. B. Chard
Piano	43	Samuel Chard	Greenwich	John A. Chard
Francis E. Webster	44	Samnel Chard	Greenwich	James Balcom
Gracie	45	John H. Plander	Rowayton	J. H. Plander
J. A. H.	46	John A. Hall	Milford	John A. Hall
Ada Morton	47	George W. Ferris	Greenwich	George W. Ferris
Sadie E.	48	Samuel Huested	Greenwich	Samuel Huested
Claudia M	49	A. Lincoln Ford	Greenwich	A. Lincoln Ford
Lizzie	50	H. P. Newman	Greenwich	H. P. Newman
Sarah L Pearsall	51	Julius Hubbell	South Norwalk	Julius Hubbell
Thistle	52	Frank Hallim	Rowayton	Frank Hollin
Nathan C	53	Elsworth E. Champlain	Rowayton	Elsworth Champlain
Susie E	54	George H. Ackerley	Rowayton	George H. Ackerly
Annette	55	James A. Smith	South Norwalk	James A. Smith
Henry R	56	Henry E. Walker	Rowayton	Henry E Walker
Francis A	57	William Godfrey	South Norwalk	William Godfrey
Wave	58	Bazilar Egbert	South Norwalk	Bazilar Egbert

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.—CONTINUED.

Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
R. and H.	59	Reed & Houseman	South Norwalk	B. P. Reed
Eva	60	Frank H. Richards	South Norwalk	Frank H. Richards
Mary F.	61	Samuel J. Ayres	South Norwalk	Samuel J. Ayres
Annie W.	62	Oscar H. Scott	Rowayton	Oscar H. Scott
Ada	63	William H. Tobey,	South Norwalk	William H, Tobey
Phebe M.	64	Abraham Decker	South Norwalk	Abraham Decker
Willie	65	George W. Kinsey	South Norwalk	George W. Kinsey
Lillie	66	John Jarvis	Rowayton	John Jarvis
Heba	67	Edwin T. Tobey	South Norwalk	Edward T. Tobey
Elsie A.	68	Charles D. Tobey	South Norwalk	Charles D. Tobey
A. H. Purdy	69	Lawson & Martineau	South Norwalk	Aaron Martineau
Ida Florence	70	William Keene	South Norwalk	William R. Godfrey
Addie L.	71	Bert Ayres	South Norwalk	Bert Ayres
Levinah	72	Lawson & Martineau	South Norwalk	Nelson Lawson
Ida May	73	Stanley Lowndes	South Norwalk	George B. Tallmadge
Willis B.	74	William L. Ackerly	Rowayton	William L. Ackerly
Carrie O.	75	George Felix	Bridgeport	Neil Anderson
Inspector	76	John Fahy	Stamford	John Fahy
Clarissa O.	77	Charles N. Eaton	New Haven	Edward B. Eaton
Claymore	78	Charles E. Palmer	Sound Beach	Elmer F. Dayton
Elk	79	Chas. R. and Ed. Smith	Bridgeport	Charles R. Smith
Ella	80	Wm. H. Quintard	South Norwalk	W. H. Quintard
Loretta E. Coleman	81	John H. Coleman	New Haven	John Coleman
Violet	82	Paragust Pierran	Bridgeport	Paragust Pierran
Eva B.	83	Eva B. Lyle	South Norwalk	William E. Lyle
Minnie S.	84	Sarah L. Starkins	Rowayton	Walter I. Thompson
Sadie	85	William Ross	South Norwalk	William Ross

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.—CONTINUED.

Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
Witch End	86	Daniel Spragur	Bridgeport	Charles Mills
Hattie A. Wallace	87	McNeil Bros.	New Haven	John P. McNeil
Minnie A.	88	John W. Burrows	Greenwich	John W. Burroughs.
Kate Akin	89	Fred'k Olson	South Norwalk	Frederick Olsen
Empress	90	John Decker & Son	Stamford	John Decker, Jr.
Ann Gertrude	91	B. F. Palmer	Greenwich	B. F. Palmer
Julian	92	William L. Whaley	Greenwich	William L. Whalley
Jennie Florence	93	Benjamin R. Wilmot	Greenwich	Orris S. H. Wilmot
A. R. Taylor	94	Benjamin R. Wilmot	Greenwich	Benjamin R. Wilmot.
Dora Dane	95	F. X. Simmell	Greenwich	F. X. Simmell
Alice	96	Nathan E. Wilcox	Milford	Nathan E. Wilcox
Carrie May	97	Daniel and Edward Burroughs	Bridgeport	Edward Burroughs
Zada	98	George N. Davis	Rowayton	George N. Davis
Mary Bell	99	M. K. and A. J. Palmer	Greenwich	Millard K. Palmer
Jennie L.	100	William R. Lowndes	Rowayton	William R. Lowndes.
Ella May	101	George Culver	Stratford	George Culver
Grayling	102	George Rowland	Bridgeport	George Rowland
Ariel	103	Fred. M. Rowland	Bridgeport	Fred. M. Rowland
Ellen B.	104	Fred. M. Rowland	Bridgeport	William H. Rowland
Neptune	105	Wallace N. Royden	Milford	Wallace N. Roybén
Mary Amelia	106	Arthur & A. P. Sherwood	Westport	A. P. Sherwood
Gracie,	107	Marchant Mitchell	Southport	Marchant Mitchell
Harry and Fred	108	H. S. Young	Rowayton	William W. Young
Three Brothers	109	Wm. C. Hulse	Rowayton	William C. Hulse
Jessie	110	Pen Parnell	Greenwich	John J. Moore
Emma	111	Charles H. Guider	Rowayton	Franklin Crocket
George D. Allen	112	John Thomas	New Haven	John Thomas

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.—CONTINUED.

Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
Belle Breckenridge	113	W. M. Rowland & Co.	New Haven	John Page.
Libbie H.	114	Andrew Heath.	South Norwalk.	Andrew Heath.
Leo.	115	Daniel P. Wicks	Rowayton.	D. P. Wicks.
Jennie and Alice.	116	Henry C. Fordham.	Stratford.	H. C. Fordham
Clara A. Palmer.	117	Charles E. Palmer.	Greenwich.	Clarence E. Palmer.
Teal.	118	Frederick & E. Sturdevant.	Bridgeport.	Fred. E. Sturdevant.
Addie.	119	Egbert N. Hallock.	Bridgeport.	Egbert N. Halleck.
Fannie S.	120	Samuel Starkins.	Greenwich.	Samuel Starkins.
Curlew.	121	Oscar S. and Oliver S. Mills.	Wilson's Point.	Oscar S. Mills
Fannie.	122	Garret F. Decker.	South Norwalk.	G. F. Decker
John H.	123	Garret F. Decker.	South Norwalk.	G. F. Decker
Mabelle.	124	Henry L. Case.	Rowayton.	H. L. Case
Caution.	125	F. T. Lyon.	South Norwalk.	F. T. Lyon.
Isabelle.	126	Wm. H. Weed.	South Norwalk.	Henry H. Brets.
Alice.	127	Westcott & Horton.	Greenwich.	Charles Westcott.
Wave.	128	Enoch Y. Marshall.	Greenwich.	E. Y. Marshall.
Hattie	129	O. S. Young.	Rowayton.	O. S. Young.
Sneak.	130	Stanley H. Lowndes.	Rowayton	Andrew S. Mills.
Benjamin Harrison.	131	John Broadway.	Rowayton.	John Broadway.
Tiger.	132	Grant B. Rackett.	Norwalk.	Grant B. Rackett.
Bessie	133	Edward N. Overton.	Milford.	E. N. Overton.
Fearless.	134	Charles A. Hurd.	Bridgeport.	Charles A. Hurd.
Stanley Howard.	135	Charles K. Wedmore.	New Haven.	Charles K. Wedmore.
Dictator.	136	Prior & Shaffer.	Stamford.	A. M. Prior.
E Pluribus Unum.	137	A. M. Prior.	Stamford.	A. M. Prior.
Madia.	138	Watson S. Wilmot.	Bridgeport.	Lawrence Layden.
Whistler	139	Charles A. Smith.	Bridgeport.	Charles A. Smith.

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.—CONTINUED.

Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
Whasp	140	George W. Eisenmann	Bridgeport	Geo. W. Eisenman
Emma L. Tracy	141	Alfred E. Friswell	Bridgeport	Alfred E. Friswell
Nellie	142	Stratford Oyster Co	Stratford	William Lally
Florance T.	143	John Farwell	Greenwich	James Farwell
Crystal Palace	144	James M. Seaman	New Haven	Thomas E. Benedict
Pauline	145	John Reynolds	Bridgeport	Ed. W. Hawley
Julia	146	S. Smith L'Hommedin	South Norwalk	D. P. Morrell, Jr.
Patrol	147	Wm. M. Merwin & Son	Milford	Leonard Durand
Julia A.	148	Boucher & Langdon	Bridgeport	Frederick Langdon
Mary Underhill	149	Charles Jack	Bridgeport	James Taggart
Nellie	150	Robert Carr	South Norwalk	Robert Carr
....	151	....	....	....
Amy B. Cole	152	H. W. Cole	Rowayton	H. W. Cole
Idlewild	153	Willis E. Bell	South Norwalk	Willis E. Bell
Hattie R.	154	George H. Shaffer	South Norwalk	John B. Rider
Mayflower	155	Charles Day	South Norwalk	Frank Day
Mabel	157	F. & W. Keister	New Haven	Willie Keister
Samuel C. Bond	158	Ashabel A. Bond	Bridgeport	A. A. Bond
No Name	159	Harry Castle	Branford	John McLean
Blue Rock	161	Charles Jack	Bridgeport	W. H. Austin
No Name	162	Leonard F. Tyler	Branford	L. F. Tyler
Sadie B.	164	Andrew Barrett	New Haven	Andrew Barrett
Gladys	165	Williard H. Sweet	Milford	W. H. Sweet
Annie	166	Samuel J. Harrison	New Haven	Samuel J. Harrison
Antelope	167	Charles G. Fanning	Bridgeport	Frank Barlow
Eva C.	169	Clarence E. Liskom	Bridgeport	C. E. Liskom
Minnie Bell	170	John Halvorsen	Bridgeport	Gust. Mattson

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.—CONTINUED.

Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
Maria D.	171	Brown Parmellee Mansfield	New Haven	Frank E. Brown
Lulu	173	George A. Palmer	Greenwich	George A. Palmer
C. D. Wicks	175	Charles D. Wicks	Stratford	Chas. D. Wicks
	176			
Hattie	177	Charles Jack	Stratford	Wilber E. Hine
Plow Boy	178	Joseph C. Miller	Stamford	Wm. A. Dodd
Elsie	179	Alexander Lofgren	Bridgeport	Alexander Lofgren
Jerome May	180	Pierre F. West	Bridgeport	Daniel G. Rider
Minerva	181	George W. Masters	Bridgeport	Geo. W. Masters
Stormy Petrel	182	George Richardson	Stratford	George W. Merrill
Jennie L.	183	Theron W. Lockwood	Rowayton	Theron W. Lockwood
	184			
Ethel R.	185	Ira E. Petty	Rowayton	Ira E. Petty
Flight	186	J. H. & J. V. Monsell	Rowayton	Joseph V. Monsell
Lady Emma	187	Charles H. Hoyt	Greenwich	Charles H. Hoyt
Isa M.	188	Herman C. Mensell and Alden Solmon	South Norwalk	Samuel Boerum
Sarah M	189	John Meeks	Milford	John Meeks
Jennie R.	190	Adolphus L. Ford	Greenwich	Adolphus L. Ford
Nevada	191	Romeo E. Bassett	Madison	William E. Bassett
Petrel	192	Fred. C. Hoyt	Bridgeport	Fred. C. Hoyt
Ellen	193	John Farewell	Greenwich	George Farewell
Bertie	194	Judson W. Hopkins	Greenwich	J. W. Hopkins
Hattie L.	195	John R. Hutton	Darien	John R. Hutton
Anchor	196	Adolf Vauntler	Bridgeport	Adolf Vautler
Surprise	197	Joseph R. Raymond	South Norwalk	William Avery
Ellen F.	198	Mrs. Ellen S. Eaton	New Haven	Edward B. Eaton

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.—CONTINUED.

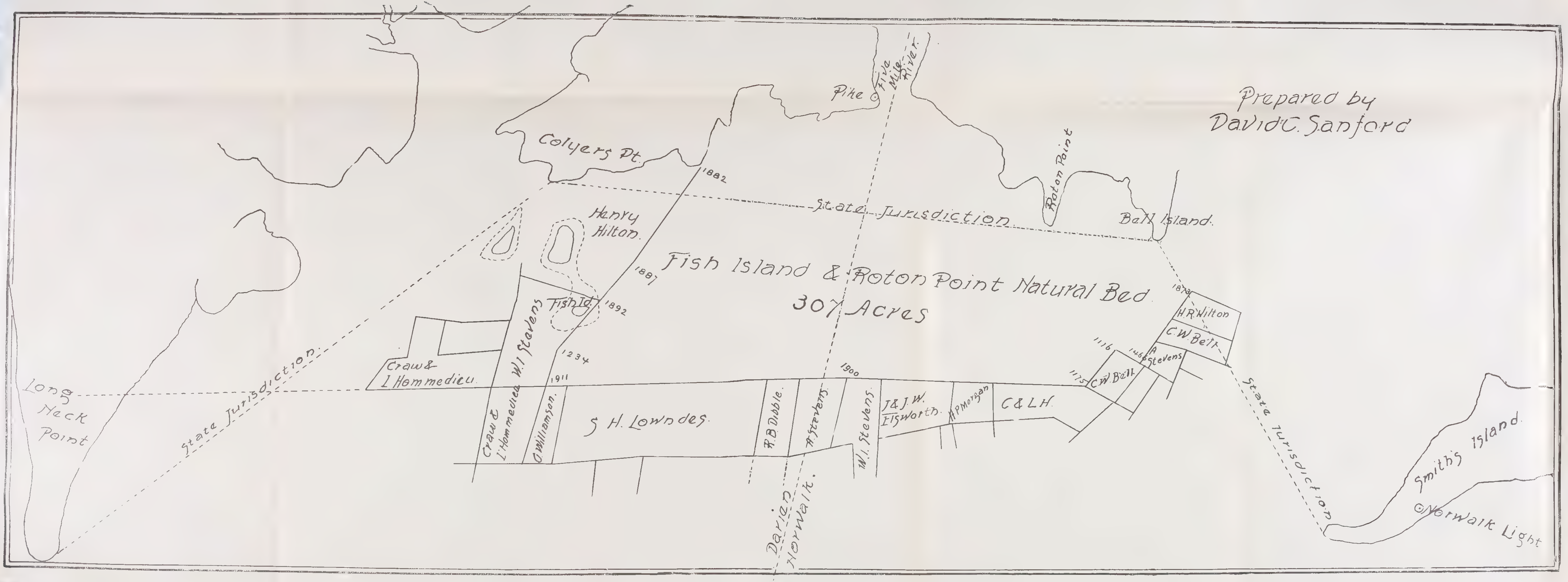
Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
Arkansas Traveller	199	Henry Cutbill	Rowayton	Henry Cutbill
Belle	200	Charles W. Bell	Rowayton	Charles W. Bell
Windward	202	B. F. Hastings	Bridgeport	B. F. Hastings
Jennie V	204	Mary G. Rider	South Norwalk	Daniel P. Morrell
Ally Ray	205	Charles W. Ford	Greenwich	Charles W. Ford
Pell	207	M. J. Decker	Norwalk	M. J. Decker
Mystery	208	John F. Wilbank	Bridgeport	George N. Evans
Laura V	209			
Susie C.	210	Samuel Chard	Greenwich	Stanley Chard
Alida	211	G. W. Mattson	Stratford	G. W. Mattson
Martin M. Mott	212	Oscar Newman	Greenwich	Oscar Newman
Irene	213	Addison Palmer	Greenwich	Addison Palmer
Bradley	216	William D. Smith	Bridgeport	William D. Smith
Lucia	217	James M. Willmott	Darien	James M. Willmott
Mosetta H	218	Preston Hart	Rowayton	Preston Hart
Ino	220	Edward H. Thompson	Stratford,	Edward H. Thompson
Pearl	222	Henry Sturdevant	Bridgeport	Henry Sturdevant
Belleport	225	William M. Merwin & Sons	Milford	Frank Brown
Ellen B.. 2d	229	Thomas Chapman	Bridgeport	Thomas Chapman
Rachael	230	Harry Hunter	Norwalk	Harry Hunter
Frank	233	Eli Bradley	Saugatuck	Eli Bradley
Lucy A. Lane	236	Edward B. Palmer	Stamford,	Edward B. Palmer
Jennie	237	William E. Burnham	Bridgeport	Andrew Billings
Magnolia	238	Charles A. Bradley	Bridgeport	Albert A. Bradley
Flora Temple	239	C. H. Knapp	Greenwich	C. H. Knapp
Ada	240	Gilbert Hopkins	Greenwich	Gilbert Hopkins
Alice	241	John F. Larraby	New Haven	John F. Larraby

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.—CONTINUED.

Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
Celia R.	242	Edward H. White.	Rowayton	Fay O. White
Pansey.	243	Frederick Marberg	Fairfield.	Frederick Marberg
Anna W.	244	Hannah Jones	New Haven	Edward R. Christie
Witch	247	John Bradley	New Haven	Thomas E. Benedict
James Kirby	249	Fred. F. Ehrsam	Bridgeport	William T. Dennis
Jessie R.	250	W. M. Rouland	New Haven	William Page
Seabird	251	Caleb Wood	East Norwalk	Caleb Wood
Nena A. Rowland	252	H. Rouland	South Norwalk	Victor Saunders
Addie Watts	254	Sarah A. Lockwood	Bridgeport	James F. Hoyt
Nidus	256	James Black	Bridgeport	Frank Burroughs
Addie R.	257	Hollins & DeWaters	Norwalk	John H. DeWaters
The Oyster	261	C. W. Hoyt & Sons	Bridgeport	C. B. Hoyt
Alice C.,	263	Henry J. Lewis	Stratford	John A. Holmberg
Lottie K	264	Edwin R. Kelsey	Branford	Gilbert Eaton
Ella	266	Kerin Ward	Bridgeport	George Linscott
Mary A.	268	George M. Gould	Bridgeport	George M. Gould
Gopher	269	Robert S. Brown	South Norwalk,	Robert S. Brown
Juanita	270	Charles H. Bedell	Bridgeport	Charles H. Bedell
Lizzie B.	271	George Bedell	Bridgeport	George Bedell
Lena	272	Lena Alvin	South Norwalk	Walter Thompson
Levena B	273	George W. Byxbee	South Norwalk	George W. Byxbee
Mist	274	J. Rasmussen	New Haven	J. Rasmussen
Flyaway	275	Edward Ayers	South Norwalk	Edward Ayres
Victor	276	Henry L. Warner	South Norwalk	Henry L. Warner
Cat	277	Richard Van Wyck	Bridgeport	Richard Van Wyck
Kittie L.	278	John W. Lockwood	Greenwich	John W. Lockwood
Jennie	279	R. E. Bassett	Madison	R. E. Bassett

LIST OF VESSELS LICENSED TO WORK UPON THE CONNECTICUT NATURAL OYSTER BEDS.—CONTINUED.

Name of Vessel.	No.	Name of Owner.	Hailing Place.	Captain.
Nellie C.	280	Harry Newman	Greenwich	Harry Newman
Fly	281	Ed. Ayers	South Norwalk	H. L. Webb
Rover	282	Samuel Thorn	South Norwalk	Ed. Ayres
Sword Fish	283	Albert A. Geib	South Norwalk	A. A. Geib



FISH ISLAND AND ROTON POINT NATURAL OYSTER BEDS. BUOYED BY THE STATE.

APPENDIX.

The following are the designations of the natural beds of Connecticut as defined by the Commission, the Courts, and the Legislature, and made a portion of the General Statutes of the State:

CORMELL REEF NATURAL BED.

The southern point of this bed is the point which is two thousand five hundred and fifty-five feet due north of a point which is one thousand nine hundred and twenty-two feet due west of the center of the tower of Great Captains Island light-house. The said southern point is also determined by the following sextant angles: Little Captains Island coast survey signal to Americus, 64° 27′; Americus to Mead, 84° 16′; Americus to Portchester spire (Methodist), 82° 56′. From the said southern point the eastern boundary line runs north twenty-eight degrees east, true meridian, seven hundred feet, to buoy known as 1002 in commissioners' buoy records, and determined by the following sextant angles: Little Captains Island coast survey signal to Americus, 70° 47′; Americus to Mead, 90° 03′; Mead to Great Captains Island light-house, 139° 15′. The following ranges pertain to this point: first, Daniel Lyon, Jr.'s, house on with High-water rock; second, sharp top tree in woods showing above all the woods, on with dock at the Americus club-house. Thence north thirteen degrees east, true meridian, one hundred and ninety feet to buoy known as 1003 in commissioners' buoy records, and determined by the following sextant angles: Little Captains Island coast survey signal to Americus, 72° 27′; Americus to Mead, 92° 00′; Mead to Great Captains Island light-house, 135° 27′. The following ranges pertain to this point: first, Methodist spire on with west end of sand beach on Calves Island; second, Rye Beach hotel on with gap or cut in Jones' stones. Thence north sixty-six degrees west, true meridian, four hundred and thirty-five feet to buoy known as 998 in commissioners' buoy records, and determined by the following sextant angles: Little Captains Islands coast survey signal to Americus, 70° 25′; Americus to Mead, 95° 43′; Mead to Great Captains Island light-house, 139° 05′. The following ranges pertain to this point: first, gap in woods on with white rock on south end of Calves Island; second, clump of woods on Long Island on with west bluff of bank of Great Captains Island. Thence south fifty-one degrees and fifteen minutes west, true meridian, nine hundred and ten feet to a point determined by the following sextant angles: Little Captains Island coast survey signal to Americus, 62° 20′; Americus to Mead, 90° 14′; Americus to Portchester spire (Methodist), 88° 42′. Thence south five degrees and fifteen minutes west, true meridian, two hundred and fifteen feet to buoy known as 1023 in commissioners' buoy records, and determined by the following sextant angles: Great Captains Island light-house to Americus, 107° 42′; Americus to Calf, 110° 27′; Summer house to Great Captains Island light-house, 107° 27′. The following ranges pertain to this point: first, barn just south of bush's woods just open to the south of barn on Bower's Island; second, south edge of stone house on with white stone near the south end of Calves Island. Thence south seventy-five degrees and twenty minutes east, true meridian, seven hundred and seventy-five feet to the point of beginning. The area comprised is fifteen acres.

PORTCHESTER BED.

Beginning at the northern piont of the bed, said point being the southeast corner of ground of Isaac Martin. The said point is known as buoy number 479 in commissioners' buoy records, and is determined by the following sextant angles: Summer-house to Calf, 131° 17′; Calf to Mead, 76° 54′; Summer-house to Great Captains Island light-house, 100° 40′; Great Captains Island light-house to Horse Neck spire, 84° 00′. The following ranges pertain to this point: first the north side of Clifford's house opens about fifty feet west of the west side of Black Tom rocks; second, the south side of bathing-house of Edward Schell is in line with the north side of the high rock of the Black Tom rocks. (The bathing-house stands on the main shore southwest of the steamboat dock at Portchester.) From the said northern point the northern boundary line runs south sixty-five degrees and fifteen minutes west, true meridian, across the highest part of Beach rock to the shore. The point on Beach Rock is determined by the following sextant angles: Summer house to Calf, 121° 38′; Calf to Horse Neck spire, 47° 54′; Summer-house to Great Captains Island light-house, 92° 08′. From the said northern point, the eastern boundary line runs south fifty-three degrees and thirty-five minutes east, true meridian, eight hundred and ninety feet, to buoy 481, at the south corner of the ground of George W. Martin. Thence south sixty-four degrees east, true meridian, one thousand eight hundred and fifty feet, to buoy 482. This point is determined by the following ranges: first, cupola of Abendroth's house over slim cedar tree, the west one of several, standing on the mainland and near the shore; second, the south side of woods on Rye Point, in line with bottom of bluff on south end of Manursing Island. Thence south sixty-six degrees and forty-five minutes east, true meridian, eight hundred and seventy-five feet to buoy 1076, the same being the south corner of ground of George Martin and Sons. Thence south four degrees west, true meridian, six hundred and eighty feet to buoy 514, at the north corner of ground of David B. Chard. This point is determined by the following ranges: first, bluff on Lloyd's Neck on with high-water mark at west end of Great Captains Island; second, liberty cap on large white boulder at the extreme west end of Brush Island over spindle on Jones' stones. Thence south thirty-one degrees and fifty minutes west, true meridian, along last mentioned range-line along ground of David B. Chard and on public domain, one thousand eight hundred and fifteen feet. Thence north sixty-seven degrees and fifteen minutes west, true meridian, one thousand four hundred and fifteen feet, in a line passing through buoys 489 and 490, and ranging: first, south side of a large tree on hill on with two cedar trees standing at the shore and nearly in line, and also in line with north end of steamboat dock. Thence north thirty one degrees east, true meridian, three hundred and eighty-five feet along ground owned or occupied by William Maguire to buoy 510. Thence north fifty-nine degrees and twelve minutes west, true meridian, one thousand four hundred and eighty feet to Big Captains Island rock. This line ranges south chimney of Brooks' house over cedar bush stuck on the Big Captains Island rock. The said rock is known in commissioners' buoy book records as position 486, Thence north fifty five degrees west, true meridian, one thousand seven hundred and sixty feet to position 478, the same being a hole drilled near the center of the outer rock at Bryam Point. A cedar bush stands in the hole. Thence northerly along the east bank of Bryam Point to intersect the northern boundary line of the bed. The area of this bed is two hundred and eighteen acres.

The following sextant angles are of record as determining the positions and points mentioned in the proceeding description, namely:

481—Summer-house to Great Captain Island light-house, 117° 42′; Great Captains Island light-house to Horse Neck spire, 84° 30′; Great Captains Island light-house to Mayo, 82° 10′.

482—Great Captains Island light-house to Calf, 97° 31′; Calf to Summer-house, 117° 26′; Great Captains Island light-house to Mayo, 89° 07′.

1076—Great Captains Island light-house to Mayo, 91° 46′; Mayo to Summer-house, 113° 44′; Great Captains Island light-house to Calf, 116° 07′.

514—Great Captains Island light house to Calf, 102° 47′; Calf to Summer-house, 86° 11′; Great Captains Island light-house to Rock, 66° 41′; Rock to Mead, 54° 21′.

489—Great Captains Island light house to Calf, 69° 29′; Calf to Rye spire, 103° 09′.

490—Great Captains Island light house to Calf, 62° 44′; Calf to Summer-house, 97° 33′.

510—Great Captains Island light-house to Calf, 62° 43′; Calf to Summer-house, 111° 43′; Great Captains Island light-house to Mead, 94° 33′; Mead to Summer-house, 79° 49′.

486—Great Captains Island light-house to Mead, 88° 50′; Mead to Summer-house, 119° 01′.

478—Summer-house to Great Captains Island light-house, 83° 00′. Great Captains Island light house to Horse Neck spire, 70° 30′ Great Captains Island light-house to Mayo, 64° 25′.

GREAT CAPTAINS ISLAND NATURAL BED.

Beginning at the point of intersection of a line due east of the Great Captains Island light-house, with a line ranging northerly and southerly over the steeple of the Methodist church in Greenwich and the west end of the building standing near the end of the steamboat dock; thence running southerly along the last mentioned line about one thousand four hundred feet to a point of its intersection with a line ranging over a gap in the high woods which are north and east of Reuben B. Lockwood's house in old Greenwich, or Sound Beach, and low-water mark southeast of the clump on Little Captains Island. This point, known as number 521 in commissioners' buoy book, is determined by the following sextant angles: namely: Stamford light-house to Horse Neck spire, 62° 19′; Horse Neck spire to Rye spire, 91° 13′; Stamford light-house to Americus, 59° 17′; Americus to Bloomer, 59° 24′. Thence running westerly on a straight line to a point formed at the intersection of two lines, one ranging over the north side of the high part of the Rye Beach hotel and the south side of the gap in the woods on a distant hill in Rye, and the other ranging over the spire of the Second Congregational church at Greenwich and a small elm tree on the west end of Great Captains Island. This point, known in commissioners' buoy book as number 421, is determined by the following sextant angles: Little Captains Island to Calf, 67° 03′; Calf to Summer-house, 42° 39′; Stamford light-house to Mayo, 61° 27′; Mayo to Rye spire, 84° 06′. The west side of the bed follows the last-mentioned range line to the high-water line on the south side of Great Captains Island; thence easterly following said high-water line, to a point which is due east from the center of the tower of the Great Captains Island light house; and thence due east to the point of beginning. The area of this bed is one hundred and fifty-two acres.

FIELD POINT NATURAL BED.

Beginning at a point in the commissioners' line of jurisdiction, where it is intersected by a line ranging over the steeple of the Second Congregational church at Greenwich and the extreme east end of the "marble house," formerly used as a marble factory, which stands near the steamboat dock; running thence southerly along said range line to its point of intersection known in commissioners' buoy book as number 453, with a line ranging westerly over the church spire at Rye, N. Y., and the south gable of the westernmost house on Calf Island. Said point is determined by the following sextant angles: Americus to Mead, 99° 20′; Mead to Great Captains Island light-house, 82° 30′: Horse Neck spire to Portchester spire, 77° to 29′; Portchester spire to Great Captains Island light-house, 93° 30′. Thence running easterly to a point known in commissioners' buoy book as number 455, formed at the intersection of two lines; one line ranging westerly over a large tree in Portchester and the center of the eastern house on Calf Island (a slim cedar tree is in the same range), and the other line ranging northerly over the steeple of the Second Congregational church at Greenwich and the west side of Black Rock, west of the Americus house. This point may be found by the following sextant angles: Americus to Mead, 90° 15′; Mead to Great Captains Island light-house, 75° to 27′; Horse Neck spire to Porchester spire, 75° 11′; Porchester spire to Great Captains Island light-house, 86° 00′. Thence running southwesterly to a point known in commissioners' buoy book as number 456, formed at the intersection of three lines: the first line ranging westerly over the northeast section of the north house on Calf Island and the north cedar tree at the shore on the east side of Calf Island: the second line ranging also westerly over the south edge of the Brooks house and the north side of the shed which stands northeast of the barns on Calf Island; and the third line ranging northerly over the steeple of the Second Congregational church at Greenwich and the flagpole on the west end of Caleb Holmes' storehouse. This point is determined by the following sextant angles: Americus to Mead, 98° 54′; Mead to Great Captains Island light-house, 93° 55′; Horse Neck spire to Portchester spire, 75° 48′ 30″; Portchester spire to Great Captains Island light-house, 103° 48′; Thence running northwesterly to a point, known in commissioners' buoy book as number 457, formed at the intersection of two lines; one line ranging over Lloyd's Neck Bluff on the east side of the east clump at Little Captain Island, at about half the height of the clump, and the other line ranging over the east end of the dining-room of the Americus House and the center of the white rock at the extreme south end of Field Point. This point is determined by the following sextant angles: Little Captain commissioners' signal to Americus, 87° 27'; Americus to Mead, 128° 37′; Americus to Porchester spire, 113° 37′; Portchester spire to Great Captains Island light-house, 118° 46′. Thence running northerly to the line of jurisdiction between the State and town in the direction of a point, known in commissioners' buoy book as number 458, formed at the intersection of two ranged lines, one running easterly over the high part of the bluff on the north side of Little Horseshoe in Cos Cob harbor and the point where the black and white rocks on the extreme southeast end of Field Point come together; and the other line running westerly over the north side of the old Benjamin Merritt House, just clear of the cedars and the southwest end of Otter Rocks. This point is a little north of said line of jurisdiction, and is determined by the following sextant angles: Stamford light-house to Great Captains Island light-house, 87° 04′; Great Captains Island light-house to Bloomer, 107° 06′; Great Captains Island light-house to Portchester spire, 110° 57′. The northern side of this bed follows the line of jurisdiction between the State and town. The area of bed is eighty-four acres.

GREENWICH POINT NATURAL BED.

Beginning at a point at the intersection of the line of jurisdiction between State and town with a line ranging Seth Quintard's house over Ami Ferris's old house; thence running southerly on said range line to its point of intersection with a line ranging westerly over a round-topped tree in Rye and the south side of Great Captains Island at low water; thence westerly along said last-mentioned range line to its point of intersection with a line ranging about northwesterly over the steeple of the Second Congregational church at Greenwich, opening west of Flat Neck woods; thence northwesterly along the last-mentioned range line to where it intersects the line of jurisdiction between the State and town; thence easterly along said line to the point of beginning. The eastern line of the bed is a line which passes through two points which are determined by the following sextant angles, namely: First point, Stamford light-house to Greenwich Point, 105° 49′ 20″; Greenwich Point to Great Captains Island light-house, 52° 17′; Stamford light house to Horse Neck spire, 99° 13′, Horse Neck spire to Great Captains Island light-house, 58° 57′. Second point: Stamford light-house to Greenwich Point, 82° 35′; Greenwich Point to Great Captains Island light-house, 63° 32′; Stamford light-house to Horse Neck spire, 88° 59′; Horse Neck spire to Great Captains Island light-house, 57° 04′. The southern line of the bed is a line which passes through two points which are determined by the following sextant angles: First point: Stamford light-house to Horse Neck spire, 82° 38′ 30″; Horse Neck spire to Great Captains Island light-house, 55° 38′. Second point: Stamford light-house to Horse Neck spire, 84° 43′; Horse Neck spire to Great Captains Island light-house, 61° 05′; Stamford light-house to Greenwich Point, 47° 23′; Greenwich Point to Great Captains Island light-house, 98° 24′. The point last given is the southwest corner of the bed. The area comprised is four hundred and three acres.

FAIRFIELD BAR AND FAIRFIELD NATURAL BEDS.

These two beds are contiguous, and the portions thereof within State jurisdiction are as follows; Beginning at the center of the tower of the Penfield Reef light-house, and starting from this point as the southeast corner of these beds, the southern boundary line runs south eighty-one degrees and twenty-four minutes west, true meridian, eleven thousand five hundred and fifteen feet to the extreme south point of the three large flat rocks at the southern end of Sunken Island. Said point is located by the following sextant angles: Penfield Reef light-house to Episcopal spire in Fairfield, 63° 10′; Episcopal spire in Fairfield to Jennings' house, 90° 26′; thence due west twelve thousand three hundred and twenty-three feet to a rock known as "the fishing rock." Said rock is situated southerly of Farms Point, and is determined by the following sextant angles: Scott's house to Jennings' house. 38° 47′; Jennings' house to Burnham's barn, 111° 11′; Scott's house to Farms Point, 74° 53′; thence from "the fishing rock" due north to the commissioners' line of jurisdiction; thence easterly along said line of jurisdiction to Pine Creek Point; thence, still following the said line of jurisdiction to Shoal Point; thence along the Fairfield bar to a point due north of the center of the tower of the Penfield Reef light-house; thence due south to the point of beginning. The area comprised is one thousand two hundred and thirty seven acres.

BRIDGEPORT NATURAL BED.

The part in State jurisdiction is described as follows: The southeast corner of this bed is the point which is three hundred and sixteen feet due east of a point which is one thousand one hundred and thirty-two feet due south of the center of the tower of the Bridgeport light house. The said southeast corner is the northeast corner of ground of David N. Armstrong. From said southeast corner the southern boundary line runs due west along ground of said Armstrong, a distance of one thousand nine hundred and thirty feet, to a point which has the following ranges: first, Black Rock light-house over the center of the woods on Wakeman's Island; second, soldiers' monument over the center of the grain elevator; thence northerly along the last-mentioned range line and along ground of Charles H. Armstrong, a distance of six hundred feet; thence south sixty-four degrees and fiftv-seven minutes west, true meridian, four thousand one hundred and twenty feet along ground of said Armstrong; thence due south six hundred and sixteen feet along ground of said Armstrong to the northwest corner of ground of Wheeler Hawley; thence south sixty-four degrees and fifty-seven minutes west, true meridian, one hundred and seventy feet along ground of Charles J. Nash. (The said bearing ranges Black Rock light-house over the center of the woods on Wakeman's Island.) Thence south nine degrees west, true meridian, five hundred and eighty feet along ground of said Nash; thence south thirty-four degrees and fifty-two minutes west, true meridian, one thousand three hundred and twenty feet along ground of said Nash; thence south eighty-one degrees and forty-five minutes west, true meridian, three thousand seven hundred and twenty feet in a direct line towards the Black Rock light-house to the east shore of Fayerweather's Island at the high-water line; thence northerly along said east shore about four hundred and fifty feet to the line of jurisdiction between the State and town; thence northeasterly along said line of jurisdiction nine thousand four hundred and twenty feet to the extreme south point of the sea wall at Seaside Park; thence southeasterly along said line of jurisdiction two thousand eight hundred and seventy-five feet; thence due south one thousand three hundred and fifty feet to the point of beginning. The area thus comprised is three hundred and thirty-four acres.

STRATFORD NATURAL BED.

Beginning at a point in the commissioners' line of jurisdiction, distant about one thousand eight hundred and thirty feet northeasterly from the center of the tower of the new Stratford Point light-house; thence running due south to a point which is determined by the following sextant angles: "Fish" to Stratford Point light-house, 105° 47′; Stratford Point light-house to Middle Ground light-house, 114° 26′; Stratford Point light-house to Penfield Reef light-house, 45° 11′. ("Fish" is the factory chimney of the oil works at Welch's Point.) The point thus located is the southeast corner of the bed, and it may also be found by intersecting the following range lines: One range line running northerly along the edge of the roof on the easterly side of the light-house keeper's new house, near the Stratford Point light-house; the other range line running northeasterly over the southeast side or face of the old hotel on Charles Island, and a tall, prominent tree at the left side of a little gap in the woods on the northern slope of a distant hill. This gap may be found by beginning at the fish works at Welch's Point and looking northerly along the crest of hills until you pass four prominent single trees, which rise above the top of the general wood line. The four trees stand near the right hand side of the gap. At the said southeast corner, the compass bearing to the tower of the Stratford Point light house, is northwest by west, and the distance to the same is one thousand four hundred and sixty feet; thence from said southeast corner running in a southwesterly direction a distance of twelve thousand two hundred and fifty feet to a point which is determined by the following sextant angles: Penfield Reef light-house to Middle Ground light-house, 99° 07′ 30″; Middle Ground light-house to Stratford Point light-house, 115° 27′; Stratford Point light-house to Bridgeport light-house, 97° 07′; Bridgeport light-house to Penfield Reef light house, 48° 18′. The approximate compass bearing of this line is southwest by west three eighths west. The terminal point of this line is the extreme south point of the bed, and is also further determined by the intersection of the following range lines: Northerly, over Ambler's house at Nichols Farms, Trumbull, and the middle poplar of the five poplar trees near the shore at Point-no-point, on which is termed the Lordship farm. The compass bearing of this range line is north by east. Northwesterly, over cupola of P. T. Barnum's house at Bridgeport, and the center of the dwelling-house attached to the Bridgeport light-house. Northwesterly again, over the cupola of Dr. Warner's house at Seaside Park, Bridgeport, and the west tree of five single trees on a ridge in the distance. The compass bearing of this range is northwest one-half north. Thence running northwesterly on a line in the direction of the spire of the Congregational church at Fairfield, a distance of thirteen thousand eight hundred and thirty feet, to its point of intersection with a line ranging northerly over the factory chimney of the Read Carpet Company at Bridgeport and the Soldiers' Monument at Seaside Park. Thence northerly along said last-mentioned range line to ground designated to Robert E. De-Forest; thence due east to southeast corner of said designation; thence due north to the commissioners' line of jurisdiction; thence easterly along said line to the point of beginning. The area comprised is three thousand and fifty-five acres.

ROTON POINT AND FISH ISLAND NATURAL BEDS.

The part in State jurisdiction is described as follows: The northeast corner is a point which is thirty-five feet due south of a copper bolt set at the extreme south end of Bell Island. Said bolt is a triangulation station and is known as "Bell Island." From said northeast corner the northern boundary line runs south eighty-one degrees and twelve minutes west along the commissioners' line of jurisdiction in the direction of the position known of record in the buoy records as 1954, a distance of five thousand eight hundred and sixty-five feet to the east line of ground of Oliver Cook. (Said east line starting from a position known of record in the buoy records as number 1882, *i. e.*, the extreme east edge of Moll's rock showing at low water, and running to position 1887, *i. e.*, the extreme east edge of Peat's rocks at low water.) Thence south twenty-three degrees and fifteen minutes west and passing through position 1887, one thousand five hundred and eighty-five feet to position 1892. (Said position 1892 being the northeast corner of rocks on Fish Island at low water.) Thence south twenty-seven degrees and forty-five minutes west seven hundred and twenty feet to buoy 1234 at the northeast corner of ground of William I. Stevens; thence south four degrees and forty-five minutes west five hundred and twenty feet, to buoy 1191 at the southeast corner of said Stevens' ground; thence north seventy-four degrees and sixteen minutes east three thousand five hundred and sixty feet, to position 1900 ; thence north seventy-eight degrees and seven minutes east two thousand nine hundred and fifty-five feet, to buoy 1175 at the southwest corner of Charles W. Bell; thence north twenty-seven degrees east six hundred and fifteen feet to buoy 1176; thence south seventy-three degrees east three hundred and forty feet, to buoy 1466; thence north twenty-two degrees and thirty minutes east one thousand and twenty feet to the commissioners' line of jurisdiction, said bearing being in line with buoy 1873; thence north forty-three degrees and thirty minutes west along said line of jurisdiction seven hundred aud sixty feet to the point of beginning. All bearings are true meridian. The area comprised is three hundred and seven acres.

The following sextant angles determine the positions and points mentioned in the preceding description, namely:

1954—Collender to Cedar Tree (Fish Island), 79° 15'; Cedar Tree (Fish Island) to Bell Island, 71° 05'; Cedar Tree (Fish Island) to Norwalk light-house, 55° 49'.

1882—Collender to Cedar Tree (Fish Island), 28° 30', Cedar Tree (Fish Island) to Norwalk light-house, 105° 40'; Cedar Tree) Fish Island) to Norwalk Spindle, 92° 44'; Norwalk Spindle to Pike, 60° 50'.

1887—Bell Island to Centennial, 100° 20′; Centennial to Collender, 91° 19′; Norwalk Spindle to Pike, 63°58′.

1892—Norwalk Spindle to Pike, 63° 10′; Pike to Centennial, 49° 08′; Norwalk light-house to Pike, 51° 31′.

1534—Norwalk light-house to Centennial, 86° 24′; Centennial to Collender, 110°48′; Bell Island to Centennial, 65° 23′.

1191—Norwalk light-house to Colyer, 82° 59′; Colyer to Collender, 106° 47′; Norwalk Spindle to Bell Island, 32° 29′.

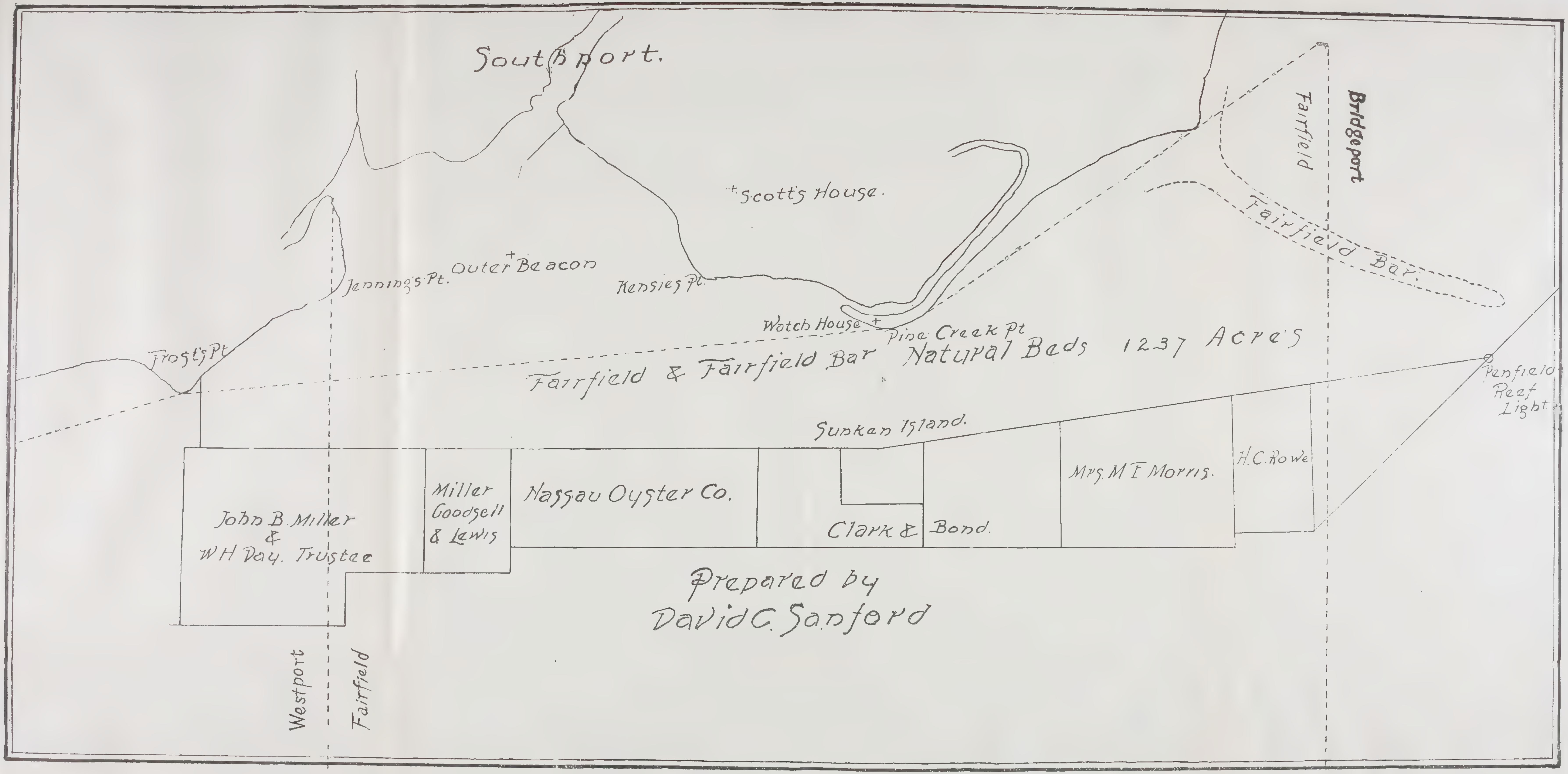
1900—Chimons to Pike, 72° 19′; Pike to Collender, 97° 55′; Tavern Island to Pike, 62° 51′.

1175—Norwalk light-house to Bell Island, 82° 41′; Bell Island to Colyer, 91° 49′: Chimons to Bell Island, 48° 23′; Bell Island to Collender, 118° 02′.

1176—Norwalk light-house to Bell Island, 96° 14′; Bell Island to Colyer, 91° 08′; Chimons to Bell Island, 55° 53′; Bell Island to Collender, 114° 07′.

1466—Chimons to Bell Island, 67° 26′; Bell Island to Centennial, 77° 54′; Norwalk light-house to Depot, 89° 10′.

1873—Chimons to Depot, 53° 41′: Depot to Centennial, 103° 07′; Chimons to Bell Island, 110° 43′.



FAIRFIELD NATURAL OYSTER BEDS. BUOYED BY THE STATE.

State of Connecticut.

NINTH ANNUAL REPORT

OF THE

INSPECTOR OF FACTORIES

OF THE

State of Connecticut,

FOR THE

TEN MONTHS ENDING SEPTEMBER 30, 1895.

HARTFORD, CONN.
PRESS OF THE CASE, LOCKWOOD & BRAINARD COMPANY.
1895.

State of Connecticut.

Office of Inspector of Factories,
Hartford, Conn., November 30, 1895.

To his Excellency O. Vincent Coffin, *Governor of the State of Connecticut.*

I have the honor to submit herewith my report for the ten months ending September 30, 1895.

Very respectfully yours,
GEO. L. McLEAN,
Inspector of Factories.

State of Connecticut.

REPORT

OF THE

INSPECTOR OF FACTORIES.

OFFICE OF INSPECTOR OF FACTORIES,
HARTFORD, CONN., November 30, 1895.

To his Excellency O. VINCENT COFFIN, *Governor:*

In accordance with the Law under which this Office is organized the Inspector of Factories herewith submits his Annual Report of the conditions as respects safety to life and health of the employes in the factories and workshops visited, together with a detailed statement of the inspections made and orders issued by this Office during the ten months ending September 30, 1895.

Number of Factories Inspected,	1,091
" Employes in the same,	93,467
" Factories in good condition,	600
" " in which changes were ordered,	491
" changes ordered,	918
" Orders given for covering set-screws,	175
" " " to guard belts,	100
" " " for better sanitary conditions,	79
" " " for better ventilation,	70
" " " for guarding elevator openings,	75
" " " for cleanliness,	41
" " " for guarding gears,	36
" " " for guarding driving wheels,	60
" " " for guarding cranks of engines,	12

Number of orders given for guarding projecting bolts in couplings, . .	19
“ “ “ to guard stairways by railing,	27
“ “ “ to guard openings in flooring,	27
“ “ “ to guard hoist and doorways,	13
“ “ “ for safety device on elevators,	22
“ “ “ for new cables, . .	9
“ Miscellaneous orders given, . .	153
“ Factories found with insufficient means of egress, ...	25

The State of Connecticut, though small in area, contains 1,801 factories and workshops in which over five persons are employed, and in which power is used. It has been impossible to inspect them all in any one year.

TABLE *showing the increase in the number, capital, employes, and products of the manufacturing establishments of the ten largest manufacturing States of the United States as reported in the Census during the decade 1880–1890.*

State.	Number of Establishments.		Capital.		Average Number of Hands Employed.		Value of Products.	
	1880	**1890**	**1880**	**1890**	**1880**	**1890**	**1880**	**1890**
New York,	42,739	65,840	$514,246,575	$1,130,161,195	531,533	850,084	$1,080,690,596	$1,711,577,671
Pennsylvania,	31,232	39,336	474,510,993	990,999,375	387,032	620,484	744,818,445	1,331,523,101
Illinois,	14,549	20,482	140,652,066	502,004,512	144,727	312,198	414,864,673	908,640,280
Massachusetts,	14,352	26,923	303,806,185	630,032,341	342,255	485,182	631,135,284	888,160,403
New Jersey,	7,128	9,221	106,226,593	249,890,428	126,038	186,901	254,380,236	353,179,917
Missouri,	8,592	14,045	72,507,844	189,236,422	63,995	142,924	165,386,205	323,897,688
Michigan,	8,873	12,127	92,930,959	262,412,240	77,591	163,941	150,715,025	277,896,706
Wisconsin,	7,674	10,417	73,821,802	246,515,404	57,109	132,031	128,255,480	248,546,164
Connecticut,	4,488	6,822	120,480,275	227,004,496	112,915	149,939	185,697,211	248,336,364
Indiana,	11,198	12,354	65,742,962	132,405,366	69,508	124,349	148,006,411	226,825,082

Connecticut, though standing 28th in point of population, ranks 9th in the value of her manufactured products.

FIRE-ESCAPES.

Manufacturing buildings that have been erected in recent years are usually found to be provided with two or more inside stairways and outside fire-escapes, but in many of the older buildings only one inside stairway is found. In a number of these buildings, which are filled with inflammable material, from twenty to a hundred female operatives are employed above the second floor. In case of fire, or any other disturbance creating a panic, there would probably be a severe loss of life. The factory laws of other states give the factory inspectors power to order such means of egress as may be necessary to protect the lives of the employes in the factories they inspect.

The law in regard to fire-escapes, found in the General Statutes, in Chapters CCLIV and CCCXLVI, of the Public Acts of 1895, reads as follows:

Chapter CCLIV.

AN ACT CONCERNING FIRE-ESCAPES.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. Every story above the first story of any building used or occupied as a schoolhouse, orphan asylum, insane asylum, reformatory of any kind, opera house, hall rented or used for public assemblies of any kind, boarding-house accommodating more than twelve persons, or tenement house occupied by more than five families, shall be provided with more than one way of egress, by stairways on the inside or fire-escapes on the outside of such building. And said stairways and fire-escapes shall, at all times, be kept free from obstruction, and shall be accessible from each room in every story above the first story.

Sec. 2. If any of the above-named buildings, or any workshop, manufactory, hotel, boarding house, tenement house, or other building in whole or in part, for any of the purposes above specified, or in which more than twenty persons shall be employed above the first story, shall be more than two stories in height, it shall be provided with at least one fire-escape, of iron or other incombustible material, on the outside of said building; and if such building shall be more than one hundred and fifty feet in length, then it shall be provided with one such fire-escape for every one hundred and fifty feet, or fractional part thereof exceeding fifty feet in length of such building; and such fire-escapes shall be conveniently accessible from each story of said building.

Sec. 3. It shall be the duty of the owner of every such building to provide such fire-escapes and means of egress. or cause the same to be provided, and if he shall neglect so to do, for a period of three months after the passage of this act, or for a period of three months after notice so to do from the building inspector or other proper authority, he shall, on conviction thereof, be fined not more than five hundred dollars, or imprisoned not more than six months, or both.

Sec. 4. It shall be the duty of the building inspector of each city, the warden of each borough, and the first selectman of each town not having a building inspector, either by himself, or by some proper person appointed by him, to inspect all of the above-named buildings at least once each year between April first and October first, and to see that the provisions of this act are complied with; and for such purpose he will have the right to enter any of said buildings in the daytime, between the hours of nine and five o'clock. And said city, borough, or town shall fix and pay the compensation for all services under the provisions of this act.

Sec. 5. This act shall not impair or affect the provisions of Chapter XXIV of the public acts of 1893 concerning fire escapes in hotels.

Sec. 6. Sections 2645, 2646, and 2647 of the General Statutes, and Chapter CLIV of the Public Acts of 1889, and Chapter CV of the Public Acts of 1893, are hereby repealed.

Approved, June 29, 1895.

Chapter CCCXLVI.

AN ACT AMENDING AN ACT CONCERNING FIRE-ESCAPES.

By it enacted by the Senate and House of Representatives in General Assembly convened:

Section two of Chapter CCLIV of the acts of this assembly, approved June 29, 1895, is hereby amended by inserting after the word "building" where it occurs the second time in said section, the words, "unless it shall be made to appear to the building inspector or other proper authority, as provided in section four of this act, that said building is already supplied with a sufficient number of safe and proper means of egress."

Approved, July 9, 1895.

This law places the enforcement of the fire-escape act in the hands of the local authorities. No less than fourteen factories have been found since July first, 1895, with insufficient means of egress from the upper floors. In every instance the proper authorities have been notified of the fact.

ELEVATORS.

Many accidents occur yearly in the use of elevators in our factories and mercantile buildings. A strict watch should be kept of the cables, and the safety devices should be tested as often as practicable. In many factories such orders are given by the owners to their master-mechanics.

Notices found on elevators, forbidding all persons from riding on the same, seem a matter of form. In many instances where the Inspector is told that no one ever rides on the elevator, the operatives can be seen riding on the same before he leaves the building.

The employment of sober and reliable men to operate elevators has no doubt been the means of saving many lives.

VENTILATION.

The subject of good ventilation in all buildings where manufacturing is carried on has been given close attention by the factory inspectors of this state. Powerful exhaust systems for removing impure air have been provided by many factory owners, where such were deemed necessary, for the protection of the health of employes. At some places these changes were made voluntarily, but in most cases were ordered. This improvement is a mutual benefit to both the employer and the employes, as the best results can be accomplished in factories by healthy and contented operatives.

In some of the older buildings the ventilation is not what would be desired, as the rooms are low and crowded in the busy seasons of the year.

SANITARY CONDITIONS.

The law in regard to the sanitary conditions of water closets especially is often violated. Several extremely bad cases have been found which would be condemned by any Board of Health.

When the employer's attention was called to the condition of such closets, the excuse was given that the help were to blame for the present state of the same. There is no doubt of the truth of this statement to a certain extent, but it does not appear just that all should be made to suffer for the filthy habits of a few.

ACCIDENTS.

Of the many accidents occurring yearly in factories throughout the state, only one fatal one has come to the knowledge of this department during the ten months ending September 30, 1895, and this through the press.

On investigation it was found to have been caused by the breaking of an elevator rope: the elevator car not being provided with any safety device, the car fell to the bottom of the shaft, catching the man riding on the same between the floor and automatic lift.

Had this man complied with an order given months previous to provide a safety device for the elevator, instead of writing it had been done, he would in all probability never have been killed in such a manner.

IN CONCLUSION.

Serious accidents in factories should be reported as they occur, to the Inspector of Factories, who could then investigate the cause, and be thereby better enabled to guard against a similar occurrence in other factories.

In the annual report of the work of this department the number and causes of all accidents occurring could be given. The factory laws of other states require the manufacturers in whose factories or workshops accidents occur to report the same to the factory inspectors. This is of valuable assistance to them in their work.

The railroad corporations of this state are required by law to report within twenty-four hours all accidents occurring on their lines to the railroad commissioners.

At present the inspector has no means of information of accidents occurring in factories, except such as are reported in the press.

I would, therefore, recommend the enactment of such laws by our legislature as will require the manufacturers of this state to report all serious accidents occurring in their factories or workshops to the Factory Inspector.

I would also thank the manufacturers of the state for their courtesies and willingness in most instances to make necessary changes.

Respectfully submitted,

GEORGE L. McLEAN,
Inspector of Factories.

REPORT OF INSPECTIONS.

Inspections and Orders from December 1, 1894, to June 30, 1895.

Order No.	Goods Manufactured.	No. of Employes	Orders Given.	Compliances.
1	Buttons,	50	Provide guards for press belts as suggested at time of inspection.	Complied.
			Securely guard plate couplings on main shafting.	
2	Mattresses,	8	Remove water-closet to a distance of at least 50 feet from main factory.	Complied
3	Wood Planing,	12	Guard by secure railing opening to pit near boiler-room.	Complied.
4	Morocco Leather,	18	Thoroughly clean engine and boiler-room, and provide suitable flooring for same	Complied.
			Cover or sink flush projecting set-screws in collars on main shaft.	
5	Paper,	14	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
			Guard bolts in plate coupling.	
			Thoroughly clean factory, and keep same as clean as the nature of the business will permit.	
6	Starch,	17	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
			Thoroughly clean factory and keep same as clean as the nature of the business will permit.	
7	Builders Hardware,	325	Guard all projecting bolts in plate couplings on main shafting.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
8	Ladies' Shoes,	240	Guard elevator openings on first floor and basement by suitable gates.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
9	Gas Stoves,	10	Provide hangers for belts to prevent same from running on shafting when not in use.	Complied.
10	Wood Work,	4	Guard all projecting set-screws in collars and couplings on main and counter shafting.	Complied.
			Guard low pully to band saw,	

11	Hats,	135	Introduce and operate within three months from date of this order such appliances, or devices, as may be necessary to secure such ventilation as shall remove the excessive steam generated in dye-shop and blowing-room.	Complied.
			Cover or sink flush projecting bolts in couplings on shaft to finishing lathes.	
			Thoroughly clean finishing room and keep same as clean as the nature of the business will permit.	
12	Straw Hats,	65	Cover or sink flush projecting bolts in couplings on main shaft, first floor.	Complied.
			Provide safety catches for elevator car to prevent same from dropping in event of accident to hoisting machinery or cable.	
13	Machinery,		No orders.	
14	Hatters' Tools,	10	Cover or sink flush all projecting set-crews in collars on shafting.	Complied.
15	Iron Castings,	50	Provide suitable ventilation in roof of cleaning-room.	Complied.
			Provide hand-rail to stairway from pattern to grinding room.	
16	Electric Power,	6	Provide guard-rail for platform, near engine.	Complied.
			Thoroughly clean floor of dynamo-room, and keep same as clean as the nature of the business will permit.	
17	Elastic Webbing,	52	Cover or sink flush all projecting set-screws in collars on shafting on first and second floors.	Complied.
18	Wagons,	5	No orders.	
19	Woolen Cloth,	200	Provide hangers for belts to keep same from running on shafting when not in use.	Complied.
			Cover or sink flush all projecting set screws in collars on shafting.	
			Provide some system for the better ventilation of wool-sorting room.	
20	Felts,	65	Box all belts running through floors to a height of 3 feet.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
			Guard all projecting bolts in plate couplings.	

REPORT OF INSPECTIONS—CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
21	Builders' Hardware,	227	Box up lacquer-room and put ventilators in roof over same, third floor, brass building. Guard driving pully and belt to tumbling barrels in passageway to foundry. Introduce and operate within three months from date of this order such appliances or devices as may be necessary to secure such ventilation as shall remove the excessive fumes of acid generated in dip-room. Provide suitable water-closet accommodations for employes in brass foundry.	Complied.
22	Hats,	70	Introduce and operate within three months from date of this order such appliances or devices as may be necessary to secure such ventilation as shall remove the excessive steam generated in blocking-room. Guard projecting set-screws in collars on shaft to finishing lathes.	Complied.
23	Hats,	140	Provide suitable flooring for sizing-room, graded in such a manner as to carry off the water and prevent same from standing on same.	
24	Hats,	100	No orders.	
25	Union Cassimeres,	80	Guard by iron railing fly-wheel to main engine. Box driving-belt running through floors of card and spinning rooms. Cover or sink flush all projecting set-screws in collars on main shafting in card and weave rooms.	
26	Woolen Goods,		Not running.	
27	Boilers and Repairing,	50	Guard by iron railing fly-wheel, crank and rod to main engine. Guard by boxing driving pully and projecting set-screws in collars. Guard by placing substantial hand rail to raised walk used for oiling main shaft, machine shop.	Complied.
28	Cotton Twills and Print Cloth.	275	Not running.	

29	Cotton Twills and Prints,	250	No orders.	
30	Gas and Electric Lights,	6	No orders.	
31	Watch Chains and Charms,	18	Guard by boxing driving pulley and belt to rolling machine. Guard boilers and engine pit by substantial railing, two bars high.	Complied.
32	Flocks and Woolen Waste,	7	Guard by boxing driving belt running through second floor. Guard by rails balance-wheel to flock cutting machine, second floor. Guard by boxing driving belt to drying machine fans. Cover or sink flush projecting set-screws in collars on main shaft.	Complied.
33	Cotton Yarns,	40	Guard by boxing gears and pulleys to mule-heads in mule room. Provide better seat accommodations to men's water-closet of mule and spinning rooms. Thoroughly clean and lime-wash ceiling of same room.	Complied.
34	Press Paper,	14	Guard by substantial rails driving pulleys and belts to paper engines. Repair rotton and weak places in floor. Guard by rails driving pulleys and belts to pulp engine.	
35	Leather Boards,	15	Guard by iron railing fly-wheel and crank and rod to main engine. Guard by substantial wood rails main shaft and pulleys to pulp engines. Cover or sink flush all projecting set-screws in collars on shafting in machine-room.	
36	Machine Twist and Sewing Silk,	19	No orders.	
37	Cotton Spool Thread,	50	No orders.	
38	Silk Machinery,	26	Guard by iron railing rod and piston to heating machine engine, ground floor.	Complied.
39	Mouldings, Turning, etc.,	60	No orders.	
40	Brass and Steam Fitters' Tools,	17	Guard by boxing or covering gears to bolt-cutting machine Guard by bar across doorway opening, second story.	Complied.
41	Paper Boxes and Printing Co.,	27	No orders.	
42	Sashes, Doors, and Blinds,	22	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
43	Silk Thread,	26	Provide hand-rail to stairway opening from winding to spinning-room.	Complied.
44	Silk Goods,	150	No orders.	
45	Yarns and Silk Throwsters,	60	No orders.	
46	Machine and Silk Thread,	55	No orders.	
47	Silk Machine Twist and Thread,	54	No orders.	
48	Steam Laundry,		Make water-closet suitable by replacing old wood-work with new, and disinfect said closet by lime-washing same.	Complied.
49	Steam Laundry,	9	Box driving belt to cuff-ironing machine. Guard by iron railing balance wheel to upright machine.	
50	Thread,	13	No orders.	
51	Wood Type,	7	Guard by casing driving belt running through floor in cutting room. Guard by iron railing fly-wheel and belt to engine. Guard by boxing driving pulley and belts to regulator.	Complied.
52	Paper Machinery,	80	Guard by casing main driving belts running through floor, machine shop. Guard by rails or casing balance wheel to main engine.	Complied.
53	Cotton Threads,	192	Provide some suitable device for elevator used in boiler-room, whereby said elevator will be securely held in event of accident to hoisting machinery or cable. Guard by secure railing driving pulley and belt to dynamo. Guard driving pulley and belt to filtering pump. Provide new cable to elevator.	Complied.

54	Cotton Thread,	627	Guard by iron rails driving pulley and belt to upright engine in heating room for office.	Complied.
			Guard by rails or covering open space in floor over heater, same room.	
			Guard driving pulleys and belts by iron rails, put combing on floor to same, in wheel-room.	
55	Cotton Thread,	76	Guard elevator landing by gates, bars, or chains.	Complied.
			Repair weak and decayed places in floor of spooling and doubling room.	
56	Cotton Thread	407	Guard by casing driving belts to carding machine, wherever trap door is away from opening in floor in carding-room; provide proper and suitable ventilation for same room.	Complied.
			Guard by casing driving belts from upper to low shafting in basement.	
			Guard by iron rails gears and driving pulleys to pump in wheel house.	
			Guard by extending iron rails across end of pit belts of main engine running in wheel room pit.	
57	Dyeing and Bleaching,	46	Guard by casing driving belt running through floor in bleach-room; repair opening in floor of same room.	Complied.
58	Spools,	41	No orders.	
59	Printing,		Provide gate to elevator opening in basement, and keep closed when elevator is away from same.	Complied.
60	Iron Castings,	20	Have windows in side and roof of wood building adjustable so the same can be opened for ventilation from inside of factory.	Complied.
			Provide better water-closet accommodations for employes.	
			Provide some system for the better ventilation of cleaning-room.	
61	Ladies' Clothing,	340	Securely guard all elevator openings by gates, chains, or rails, and keep closed when elevator is away from same.	Complied.
62	Straw Hats,	130	Keep doors to hoistways closed when not in actual use	Complied.
			Provide some system for girls' sewing-room, fourth floor, by which better ventilation can be secured.	
63	Hats,	115	No orders.	

REPORT OF INSPECTIONS—CONTINUED.

Order No.	Goods Manufactured.	No. of Employees.	Orders Given.	Compliances.
64	Hat Forming,	20	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.
			Box belt running through floor to exhaust fan.	
			Cover or sink flush all projecting set screws in collars on shafting.	
65	Electric Lights,	4	No orders.	
66	Hatters' Furs,	84	Guard by boxing low shafting in brushing-room, second floor.	Complied.
67	Hats,	130	Provide good brick and cement floor for makers, shop graded, in such a manner as to prevent water from standing on same.	Complied.
			Thoroughly clean finishing-room and keep same as clean as the nature of the business will permit.	
68	Hats,	60	Guard by secure railing elevator opening in attic.	Complied.
69	Vehicles,	10	No orders.	
70	Corsets,	700	No orders.	
71	Carriages,	10	No orders.	
72	Hats,	105	Provide more than one way of egress from third to second story by additional stairway on the inside or fire escape on the outside of building.	Complied.
73	Hats,	141	Guard more securely elevator openings on second and third floors.	Complied.
			Cover or sink flush projecting set-screws in collars on shaft to finishing lathes.	
74	Wood Work,	30	No orders.	
75	Hatters' Furs,	28	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
			Thoroughly clean factory and keep same as clean and well-ventilated as the nature of the business will permit.	
76	Iron Castings,	14	No orders.	
77	Air Compressors,	100	Guard by suitable railing elevator opening, first floor.	Complied.
			Provide better water-closet accommodations for employes, and keep same in good sanitary condition.	
78	Shoes,	14	No orders.	

79	Iron Railing,	4	Provide better water-closet accommodations for employes on second floor and keep same in good sanitary condition.	Complied.
			Guard or sink flush all projecting set-screws in collars on shafting, first floor.	
80	Hats,	10	Thoroughly clean factory and keep same as clean and well-ventilated as the nature of the business will permit.	Complied.
			Thoroughly clean and disinfect water-closets and keep same in good sanitary condition.	
81	Paper Boxes,	65	No orders.	
82	Cigars,	60	No orders.	
83	Cigars,	50	No orders.	
84	Clothing,	48	No orders.	
85	Shoes,	63	Guard crank and rod to engine by extending railing.	Complied.
			Provide hand-rail for stairway from first to second floor, north end of building.	
86	Shoes,	74	Box driving belt running through floor, second story.	Complied.
87	Wagons,	10	No orders.	
88	Shirts and Overalls,	8	No orders.	
89	Sieves,	10	Repair flooring in wheel-pit.	Complied.
			Either strengthen by new and substantial timber, bridge leading over stream, or entirely remove same.	
90	Shoes,	10	No orders.	
91	Cotton Gins and Printing Presses,	150	No orders.	
92	Laundry,	8	Guard fly-wheel to engine by iron railing four feet in height.	Complied.
93	Machinery,	32	Guard by placing hand-rail to bridging used for oiling counter shaft running slot machines.	Complied.
			Sink flush or cover all projecting set-screws in collars on counter shaft driving slot-cutting machine.	
94	Vises and Ship Clamps,	25	No orders.	
95	Paper Wrappers and Boards,	30	Guard main driving-gears to paper machine by boxing.	Complied.
			Guard by substantial railing main driving-belts to paper machine.	
			Provide hand-rail to bridge over pit to paper machine.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
96	Repair Shop,	10	Guard elevator openings by keeping gates closed when elevator is away from same	Complied.
			Keep room as clean as the nature of the business will permit.	
			Clean and disinfect water-closets	
97	Firearms,	54	Guard elevator opening by keeping gates closed when elevator is away from same.	Complied.
			Keep rooms as clean as the nature of the business will permit.	
			Clean and disinfect water-closet.	
98	Envelope Machinery,	15	Guard by iron railing, at least three feet in height, crank and rod to main engine.	Complied.
99	Belting,	30	Provide new cable to elevator.	Complied.
			Cover or sink flush all projecting set-screws in collars on counter shaft, third floor.	
100	Firearms,	36	No orders.	
101	Wood-Working Machinery,	135	No orders.	
102	Stockinets,	33	Provide some suitable mechanical device whereby elevator will be securely held in event of accident to hoisting machinery or cable.	Complied.
			Guard all elevator openings by gates, bars, or chains, and keep closed when elevator is away from same.	
			Remove all decayed wood-work in water-closets and replace by new, thoroughly clean water-closets, lime-wash walls and ceiling of same, and keep in good sanitary condition.	
			Thoroughly clean factory and keep same as clean as the nature ef the business will permit.	
			Cover or sink flush all projecting set-screws in collars on main shaft, card room.	

103	Cotton Goods,	53	Guard by casing, driving-belt running through floor in warper room. Remove all decayed wood-work in water-closets and replace by new, thoroughly clean the same, lime-wash walls and ceilings, and keep in good sanitary condition. Provide some suitable mechanical device whereby elevator will be held securely in event of accident to hoisting machinery or cable. Keep gates at elevator openings closed when elevator is away from same.	Complied.
104	Cotton Goods,	21	Provide some suitable mechanical device whereby elevator will be securely held in the event of accident to hoisting machinery or cable. Keep gates at all elevator openings closed when elevator is away from same. Remove all decayed wood-work in water-closets and replace by new, thoroughly clean and lime-wash walls and ceilings of same, and keep in good sanitary condition. Repair weak places and holes in floor of card-room. Guard by boxing, gears and belts to mule heads.	
105	*A.*—Cotton Goods,	33	Guard by iron railing, crank and rod to engine. Cover or sink flush all projecting set-screws in collars on main shaft, spinning room. Provide suitable water-closet accommodations for employes, lime-wash walls and ceilings of same, and keep in good sanitary condition. Thoroughly clean entire factory and keep same as clean as the nature of the business will permit.	Complied.
105	*B.*—Fancy Woolens and Cassimeres,	125	No orders.	
106	Union Cassimeres,	77	Guard main driving-belt running over work-bench by placing bridging underneath belt, east end of weave-room. Cover or sink flush all projecting set-screws in collars on shafting. Thoroughly clean and disinfect water-closets, and keep same in good sanitary condition.	Complied.

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
107	Cotton Goods,	226	Thoroughly clean and disinfect water closets, and keep same in good sanitary condition.	Complied.
			Guard by replacing iron railing to crank and rod of engine.	
			Provide some suitable mechanical device whereby elevator will be held securely in event of accident to hoisting machinery or cable.	
108	Cotton Sheeting,	220	Cover or sink flush projecting set-screws in collars on main shaft in slasher-room.	Complied.
			Guard by placing chain at elevator landing.	
109	Cotton Sheetings,	76	Guard by secure railing, crank and rod to engine.	Complied.
			Thoroughly clean and disinfect water-closets, and keep same in good sanitary condition.	
			Provide one additional water-closet for female employes.	
			Guard main driving-belt by bridging under same where running over looms.	
			Provide some suitable mechanical device whereby elevator will be securely held in the event of accident to hoisting machinery or cable.	
110	Woolen Cassimeres,		Not running.	
111	Cotton Goods and Shirtings,	275	No orders.	
112	White Cotton Goods,	210	No orders.	
113	Cotton Goods,	741	No orders.	
114	Weaving Reeds,	7	No orders.	
115	Hosiery,	17	No orders.	
116	Hosiery,	50	No orders.	
117	Confectionery,	18	Thoroughly clean factory and keep as clean as the nature of the business will permit.	Complied.
118	Chemicals,	50	No orders.	
119	Stairbuilder,	5	No orders.	
120	Machinery,	6	Cover or sink flush all projecting set-screws in collars on main shafting.	Complied.
121	Printing,	7	Provide suitable water-closet accommodations for employes.	Complied.

122	Wood Patterns,	5	Provide suitable water-closet accommodations.	Complied.
123	Gas and Electric Lights,	10	Provide suitable water-closet accommodations for employes of, occupying your premises.	Complied.
			Cover or sink flush all projecting set screws in collars on main shaft.	
124	Shoes,	95	Provide hangers for press-belts to keep same from running on shafting when not in use.	Complied.
125	Stoves and Furnaces,	55	Guard projecting bolts in plate couplings.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
126	Vehicles,	12	No orders.	
127	Pianos,	25	No orders.	
128	Hatters' Furs,	125	Guard by boxing low shafting and pulleys to cross-cut rip-saw frame, top floor.	Complied.
			Guard pulley to brushing machine near passageway, fourth floor.	
			Box main belt from engine to storage-room.	
129	Fire Brick,	15	No orders.	
130	General Wood Work,	100	Securely guard large pulleys and belts to matchers, first floor.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
			Thoroughly clean and disinfect outside water-closet.	
131	Curled Hair,	12	Securely guard projecting bolts in plate couplings on main shaft, first floor.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
132	Machinery and Jobbing,	5	No orders.	
133	Builders' Hardware,	1,050	Guard by rail or gate elevator opening, first floor, wood-working department.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
134	Typewriting Machines,	60	Introduce and operate, within three months from the date of this order, such appliances or devices as shall be necessary to remove the excessive dust generated in buffing and polishing-room.	Complied.
135	Cigars,	15	No orders.	
136	Baby Carriages,	6	No orders.	
137	Straw Hats,	200	Cover or sink flush projecting set-screws in collars on main shaft, third floor.	Complied.
			Put elevator gate on first floor in proper working order.	
138	Thread,	28	Guard by boxing driving-pulleys and belts to winders in thread-winding room.	Complied.

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
139	Ceiling Decorations,	27	Guard elevator landing, first floor, and put gates on second and third floors in proper working order.	Complied.
140	Mosaic Marble,	30	No orders.	
141	Weiss Beer,	5	Provide secure railing around platform to large kettle, first floor.	Complied.
142	Vehicles,	6	No orders.	
143	Druggists' Supplies,	30	Guard by secure railing fly-wheel to engine.	Complied.
144	Bells,	75	Guard by railing fly-wheel and crank of engine.	Complied.
			Cover or sink flush projecting set-screws in collars on counter shafting.	
			Guard by rail elevator landing, first floor.	
			Guard elevator hatchways by beveled protectors.	
			Provide new cable for elevator	
145	Clocks,	385	True up shafting and tighten hangers for same on first floor dial shop.	Complied.
			Guard all elevator hatchways by beveled protectors.	
			Guard elevator landing first floor in movement shop	
			Provide hand-rail to stairway from third to second floor in movement shop.	
			Strengthen weak spots in flooring of attic in movement shop.	
			True up main shaft on third floor in south end of main building.	
146	Garters and Arm Bands.	18	No orders.	
147	Clock Dials,	9	True up counter shaft second floor, north side.	Complied.
			Thoroughly clean room on second floor, west end of factory.	
148	Clock Springs,	23	Box main driving belt running through first floor.	Complied.
149	Springs,	15	No orders.	
150	Shears,	55	Guard by extending casing to main driving wheel and belt in engine-room.	Complied.
			Connect all dry polishing with exhaust system.	
			Provide better ventilation in buffing-room and polishing-room in attic.	

151	Paper Boxes,	18	Guard elevator hatchway by beveled protectors	Complied.
152	Spoons and Forks,	140	Cover or sink flush projecting set-screws in collars on counter shaft west end of press-room.	Complied.
153	Electricity,	5	No orders.	
154	Bakery Goods,	7	Remove decayed cross beams and flooring to bakery and replace by new.	
			Secure better ventilation by permanently closing openings in walls of cellar on the east and west sides.	
155	Bakery Goods,	6	Thoroughly clean bakery and keep the same as clean as the nature of the business will permit.	
			Put outside stairs leading to bakery in proper condition.	
156	Baking,	3	No orders.	
157	Baking,	8	No orders.	
158	Kindling Wood,	9	Guard by secure railing crank and fly wheel to engine.	Compiled.
159	Mouldings,	5	Box main driving belt running through floor.	Complied.
160	Vehicles,	8	No orders	
161	Baking,	8	Guard gearing of breaker machine.	Complied.
			Thoroughly clean bakery and keep same as clean as the nature of the business will permit.	
			Put water-closet in such condition that it can be used and keep same in good sanitary condition.	
162	Ladders,	12	No orders.	
163	Flower Stands,	8	No orders.	
164	Baking,	16	No orders.	
165	Grain Elevator,	6	No orders.	
166	Trunk Hardware,	53	Cover hole in flooring at entrance to stairway, old building.	Complied.
167	Malleable and Gray Iron Castings,	200	Guard freight elevator openings by beveled protectors.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
168	Underwear,	200	Provide secure railing at bearings in wheel-pit as a safeguard for oiler	Complied.
			True up shafting for blower in main building first floor.	
			Tighten hangers for elevator drum shaft.	
169	Wood Turning,	6	No orders.	
170	Saws,	10	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
171	Mineral Grinding,	20	Guard by railing low shafting and pulleys in warehouse.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
172	Wood Work,	5	Guard by boxing, low shafting and pulleys to planer.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
173	Piano Hardware,	140	Provide better ventilation in drill-room.	Partly Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
			Provide additional windows in roof of chipping and cleaning-room and have the same adjustable, so as to be easily opened for ventilation.	
			Introduce and operate within three months from the date of this order such appliances or devices as may be necessary to remove the excessive dust generated in polishing room, and secure such ventilation as shall remove excessive steam in plating-room.	
			Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	
174	Iron Castings,	11	Cover or sink flush all projecting set-screws in collars on shafting in machine-room.	Complied.
175	Electricity,	6	No orders.	
176	Gas Stoves,	18	Guard by boxing belt running through floor second story.	Complied.
			Guard by covering or sinking flush all projecting set-screws in collars on shafting.	
			Thoroughly clean factory and keep same as clean as the nature of the business will permit.	
177	Vehicles,	5	No orders.	
178	Dye Stuffs,	240	Guard by secure railing driving-wheels to bark-cutting machine.	Complied.
			Guard by secure railing fly-wheel of engine in carpenter shop.	
			Cover or sink flush all projecting set-screws in collars on shafting and projecting bolts in plate couplings.	
179	Cotton Underwear,	40	Provide better ventilation in sewing-room, top floor, by registers in sides of building or ventilators in roof.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	

180	Cigars,	12	No orders.	
181	Shirts and Underwear,	27	Guard by covering or sinking flush projecting set-screws in collars on counter shaft near engine.	Complied.
182	Cigars,	5	No orders.	
183	Vehicles,	5	Guard plate couplings and cover or sink flush all projecting set-screws in collars on shafting.	Complied.
184	Silver Plated Ware,	20	No orders.	
185	Brass Goods,	150	Introduce and operate within three months from date of this order such appliances or devices as may be necessary to remove the excessive dust generated in buffing room.	Partly Complied.
			Box main driving-belt to second floor of new main building.	
			Securely guard projecting set-screws and bolts on shafting in stamp-room in old factory.	
186	Silver Plated Ware,	40	No orders.	
187	Decorated Glass Ware,	50	No orders.	
188	Car and Engine Repairing,	5	No orders.	
189	Cutlery,	240	Introduce and operate within three months from the date of this order such appliances or devices as may be necessary to remove the excessive dust generated in the fork-room.	Complied.
			Guard by boxing driving-belt through floor of finishing-room.	
			Guard gears to large press in press room.	
190	Bolts,	255	Guard all elevator openings on first floor by gates.	Complied.
			Cover or sink flush all projecting set-screws in collars on main and counter-shafting.	
			Box belt through floor second story.	
191	Rock Drills,	10	No orders.	
192	Woolen Cloth,	300	Guard all projecting bolts in plate couplings on shafting.	Complied.
			Put gates at all elevator openings in good working order so same shall be closed when elevator is away from openings.	
			Clean and disinfect water-closet and keep same in good sanitary condition.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
193	Piano Stools,	71	Provide more than one way of egress from third and fourth floors in new brick building, by additional stairs on the inside or fire escape on the outside of building.	Partly Complied.
			Box belt through floor to saw frame first story.	
			Provide better water-closet accommodations for male employes.	
			Keep blower in wood-working department in operation so as to remove the excessive dust generated therein.	
			Cover or sink flush all projecting set-screws in collars on shafting.	
194	Fire Works,	80	No orders.	
195	Edge Tools and Spoons,	131	No orders.	
196	Hatters' Machinery,	30	Remove set-screw in pulley on main shaft near driving-pulley for moulding machine on second floor.	Complied.
			Provide hangers for driving belt of moulding machine, second floor.	
197	Hats,	125	Guard by secure railing crank and rod of engine.	Complied.
			Introduce and operate within three months from date of this order such appliances or devices as may be necessary to secure such ventilation as shall remove the excessive steam in all sizing-rooms.	
198	Carriages,	7	Guard by secure railing fly-wheel of engine.	Complied.
199	Machinery,	44	No orders.	
200	Hat Wires,	5	No orders.	
201	Hat Wires,	3	No orders.	
202	Wood Work,	4	No orders.	
203	Hats,	227	Guard by secure railing, four feet high, driving-wheel and belt of engine.	Complied.
			Repair flooring in passageway from finishing to drying-room.	
			Provide substantial hand-rails to main stairways.	
204	Hats,	30	No orders.	
205	Hats,	92	Guard by secure railing fly and driving wheel of engine.	
			Provide substantial hand-rails to main stairways.	
			Guard by secure railing main stairway opening on second floor.	

206	Hats,	175	Put fan of dye shop in proper working order and operate same.	
			Cover or sink flush all projecting set screws in collars on shafting.	
			Thoroughly clean water-closets for employes in sizing-room and keep the same in good sanitary condition.	
			Provide substantial hand-rails to all principal stairways.	
207	Electric Power,	4	No orders.	
208	Hats,	60	Sink flush projecting set-screw in collar on low shaft of tip stretching machine	Complied.
			Introduce and operate within three months from date of this order such appliances or devices as may be necessary to secure such ventilation as shall remove the excessive steam in sizing and dye-rooms.	
			Provide better drainage in sizing-room.	
			Provide secure hand-rails to stairs from dry to sizing-room.	
			Guard by casing main driving-wheel and belt of engine.	
			Box driving belt in forming room.	
			Provide substantial stairway with hand-rail in stiffening room.	
			Disinfect all outside water-closets and keep same in good sanitary condition.	
209	Hats,	13	Disinfect outside water-closets and keep in good sanitary condition.	Complied.
210	Hat Boxes and Cases,	5	Provide substantial hand-rail to stairs from first floor to basement.	Complied.
211	Hats,	125	Guard by secure railing pit to driving-wheel and belt of engine.	
			Guard by boxing quarter turn belt in makers' room.	
			Box belts running through floor in blowing-room.	
			Provide substantial hand-rails to stairs from finishing to trimming-room and to stairs leading from stiffening-room.	
			Thoroughly clean men's water-closets and keep same in good sanitary condition.	
			Provide more than one way of egress from third floor by additional stairs on the inside, or fire-escape on the outside of building.	
212	Silk Hat Bands and Braids,	38	Sink flush projecting set-screw on low shaft of braider in basement.	Complied.
			Sink flush projecting set-screws in collars on low shafting to looms on second floor.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
213	Hatters' Fur,	125	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
			Introduce and operate within three months from date of this order such appliances or devices as may be necessary to remove the excessive dust generated in following named rooms, skin-room, carody-room, blowing-room, chopping-room, and cutting-room.	
214	Hatters' Fur,	102	Introduce and operate within three months from date of this order such appliances or devices as may be necessary to remove the excessive dust generated in following named rooms: skin-room, carody-room, blowing room, chopping-room, and cutting-room.	Complied.
215	Hatters' Fur,*	48	Introduce and operate within three months from date of this order such appliances or devices as may be necessary to remove the excessive dust generated in factory.	
			Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	
			Thoroughly clean outside water-closet and keep the same in good sanitary condition.	
			Cover or sink flush projecting set-screw in collars on shafting.	
			Put mixture machine in proper running order to prevent excessive jar to building.	
216	Hats,	250	Guard by beveled protectors elevator openings of passenger elevator.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
217	Hats,	200	Provide secure hand-railing to all principal stairways.	Complied.
218	Machinery and Jobbing,	5	No orders.	
219	Hats,	260	Replace bridge leading to sizing-room.	Complied.
			Repair flooring of dry-room in attic of old building near passage to new building.	
220	Hats,	32	No orders.	
221	Twist Drills,	30	No orders.	
222	Sash, Doors, and Blinds,	18	Guard by railing elevator landing first floor.	Complied.

* Factory burned May 3, 1895.

223	Hats,	250	Repair flooring of engine-room.	Complied.
			Guard by secure iron railing crank and rod of engine.	
			Provide hand-rail to stairs from trimming to packing-room.	
			Thoroughly clean outside water-closets and keep the same in good sanitary condition.	
224	Hats,	150	Provide substantial hand-railing to all principal stairways.	Complied.
			Box driving belt running through floor of finishing-room.	
225	Hatters' Fur,	9	Guard by substantial railing opening in floor over boiler in stock-room, also to stairway openings in stock and cutting-rooms.	Complied.
			Provide hand-rails to stairs from cutting-room.	
226	Wood Work,	15	Box driving-belt running through floor, circular saw.	Complied.
227	Hats,	90	Repair floor of sizing-room.	Complied.
			Repair stairway from finishing to trimmers' room.	
228	Hats,	125	No orders.	
229	Special Machinery,	5	No orders.	
230	Hat Sweat Stitching,	5	No orders.	
231	Hat Forming,	25	Repair and thoroughly clean water-closet for females.	Complied.
			Box belts running through floor of blowing-room.	
232	Hat Sizing in the rough,	9	No orders.	
233	Hats,	110	No orders.	
234	Hats,	120	Guard by boxing driving-belt near floor in finishing room.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
235	Hats,	106	No orders.	
236	Hats,	10	No orders.	
237	Hats,	200	Guard by secure iron railing crank and rod of engine.	Complied.
			Provide substantial hand-rails to all principal stairways.	
238	Hats,	90	Guard by secure railing driving-wheel of engine.	Complied.
			Provide substantial hand-rail to front stairway.	
239	Hats,	120	Box belt running through floor of blowing-room.	Complied.
240	Paper Boxes and Hat Cases,	11	Provide more than one way of egress from upper floor by additional stairway on the inside or fire escape on the outside of building.	Complied.
241	Hats,	13	No orders.	
242	Corsets,	50	Guard by secure railing fly-wheel of engine.	Complied.
243	Ladies' Hats,	36	No orders.	
244	Sheep Leather,	17	Guard by beveled protecters all elevator openings.	

REPORT OF INSPECTIONS—CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
245	Corsets,	7	No orders.	
246	Hats,	32	Box belt running through floor of finishing-room. Guard set-screws in collar on end of low shafting in finishing-room.	Complied.
247	Hats,	15	No orders.	
248	Ladies' Hats,	73	Guard by secure iron railing fly-wheel of engine.	Complied.
249	Hats,	11	Provide better ventilation in finishing-room by operating fan.	Complied.
250	Hats,	50	Guard by secure iron railing fly-wheel of engine.	Complied.
251	Manilla Paper,	14	Box belt running through floor in beating engine-room. Provide secure passageway to water-wheel. Guard by railing gears of water-wheel. Guard by boxing driving-wheel and gears to paper machine in machine-room.	Complied.
252	Hats,	250	Provide substantial hand-rails to all principal stairways in No. 1 and 2 factories.	Complied.
253	Hardware Specialties,	67	No orders.	
254	Firearms,	1,600	Guard gears to straightner in rolling-room. Provide better ventilation in basement of No. 3 building. Introduce and operate within three months from the date of this order such appliances or device as may be necessary to remove the excessive dust generated in wood working-room, stock department.	Partly Complied.
255	Elevators,	50	No orders.	
256	Sheet Copper and Augers and Bits,	75	Securely guard plate couplings on shafting over forging-drops in auger department. Introduce and operate within three months from date of this order such appliances or devices as may be necessary to remove the excessive dust generated in polishing-room, brick building.	Complied.
257	Telegraph Wire,	87	Guard by secure iron railing cable-winder, first floor main building.	Complied.
258	Rubber Goods,	35	No orders.	
259	Pins,	10	No orders.	

260	Machinery,	7	No orders.	
261	Plush Goods,	200	Box driving-belt running through floor in packing-room not less than three feet in height.	
			Guard by gates or other safety appliances all elevator openings of new elevator, and keep closed when the elevator is away from same.	
			Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	
262	Perfumery,	14	Provide ventilating pipes for water-closets on second and third floors.	Complied.
263	Shirts,	22	No orders.	
264	Steel Saws,	17	No orders.	
265	Heating Apparatus,	28	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.
			Have windows on east side of factory cleaned so as secure better light for employes.	
266	Electrotyping,	12	Provide better ventilation for moulding-room.	Complied.
267	Firearms,	7	No orders.	
268	General Iron Work,	30	No orders.	
269	Coach Lamps,	30	No orders.	
270	Corsets,	248	No orders.	
271	Iron Castings,	125	No orders.	
272	Brass and Copper Metals,	205	Box driving belt running through floor, second story wood building.	Complied.
			Provide ventilators for roof of trimming-room.	
			Cover or sink flush all projecting set screws in collars on shafting.	
			Overhead shafting not to be oiled while in motion except from floor.	
273	Nails,	68	Guard by boxing low shafting to wire bench.	Complied.
274	Paper,	9	No orders.	
275	Stove Trimmings,	33	Introduce and operate within three months from date of this order such appliances or devices as may be necessary to remove the excessive dust generated in buffing-room.	Complied.
			Provide such ventilation as may be necessary to remove the excessive steam generated in plating-room.	
276	Chisels,	20	Provide new floor for machine-room.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
			Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
277	Auger Bits,	60	Introduce and operate within three months from the date of this order such appliances or devices as may be necessary to remove the excessive dust generated in polishing-room.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
278	Edge Tools,	30	No orders.	
279	Butter,	8	No orders.	
280	Vehicles,	12	No orders.	
281	Carriage Repairing,	5	No orders.	
282	Packers of Beef,	12	No orders.	
283	Sewing-Machine Attachments,	75	Provide hangers for belts to keep same from running on shafting when not in use.	Complied.
284	Paper Boxes,	34	No orders.	
285	Shoes,	65	Provide new flooring for first story.	Complied.
			Provide some way of lighting stairway from first to second story.	
286	Paste and Paper Boxes,	73	No orders.	
287	Round Paper Boxes,	20	No orders.	
288	Suspender Buckles,	110	No orders.	
289	Corsets,	175	No orders	
290	Corsets,	295	No orders.	
291	Underwear,	131	Provide new flooring for basement and have the same inclined so as to prevent water standing thereon.	Complied.
292	Metal Art Goods,	20	Provide hangers for belts to keep same from running on shafting when not in use.	Complied.
293	Underwear,	150	Provide better ventilation in carding-room by the placing of three or more ventilators in roof.	Complied.
			Provide hangers for belts to keep same from running on shafting when not in use.	
294	Rubber Clothing,	109	Guard by gates, bars, or chains elevator openings in clothing department, and keep closed when elevator is away from same.	Complied.

295	Rubber Boots and Shoes,	1000	Box gears to upper and soling machines and gears to rag calendar in grinding-room.	Complied.
			Box belt running through floor in heater-room.	
			Put gates at all elevator openings in good working order and keep closed when elevator is away from same.	
296	Curtain Rings,	7	No orders.	
297	Paper Boxes,	61	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
298	Rubber Reclaiming,	60	Guard small gears to rubber grinders, first floor.	Complied.
			Guard by secure railing or sliding doors hoisting opening in south end of factory.	
299	Rubber Boots and Shoes,	700	No orders.	
300	Sheet Brass and German Silver,	75	No orders.	
301	Bit Braces,	5	No orders.	
302	Shears,	7	No orders.	
303	Light Hardware,	5	Introduce and operate within three months from date of order such appliances or devices as may be necessary to remove the excessive dust generated in polishing room.	Complied.
			Repair floor at the head of stairway.	
			Repair stairs.	
304	Lamp Burners,	12	Provide hand-railing to stairs and stairway landings.	
305	Lamps, Burners, etc.,	213	Guard by boxing or railing tread of punch press in drop-press room.	Complied.
306	Shoddy,	30	Cover or sink flush all projecting set-screws in collars on main shafting.	Complied.
307	Manilla Paper,	12	Remove rubbish on the south side of machine room.	Complied.
308	Packing Cases,	63	Guard by secure railing passageway from box shop to grist mill in basement.	Complied.
			Guard opening in floor near circular saw by casing six inches high in basement of box shop.	
309	Gunpowder,	125	No orders.	
310	Bolts and Nuts,	60	Cover or sink flush all projecting set-screws in collars on main and counter-shafting.	Complied.
311	Machinery and Light Hardware,	8	Provide landing for stairway and guard main belt by secure railing at said landing.	Complied.
312	Brick,	20	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
313	Bolts,	54	Guard by secure railing fly-wheel of engine. Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
314	Carriage Hardware,	60	Overhead pulleys to drop-forges not to be cleaned while in motion. True up main and counter-shaft in drop shop.	Complied.
315	Carriage Hardware,	90	Guard by bars, gates, or chains all elevator openings in machine-room and keep closed when elevator is away from same. Provide new cable for machine shop elevator. Provide beveled protectors to elevator openings.	Complied.
316	Paper Bags,	52	Guard by gates, bars, or chains all elevator openings and keep closed when elevator is away from same. Guard all elevator openings by beveled protectors. Repair flooring in printing-room near engine-room. Provide more than one way of egress from fourth and third floors by additional stairs on the inside or fire-escape on the outside of building.	Complied.
317	Carriage Hardware,	16	Guard elevator opening by beveled protectors.	Complied.
318	Rivets,	6	No orders.	
319	Tinners' Machines and Tools,	142	Guard elevator openings by beveled protectors. Introduce and operate, within three months from date of this order, such appliances or devices as may be necessary to remove the excessive dust generated in polishing and trimming-rooms.	Complied.
320	Floor Cleating Plates,	7	No orders.	
321	Edge Tools,	100	Guard elevator opening by beveled protectors.	Complied.
322	Electric Power,	5	No orders.	
323	Castings,	160	Cover or sink flush all projecting set-screws in collars on shafting in tumbler and boiler-room.	Complied.
324	Spring Needles,	8	No orders.	
325	Chucks,	26	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
326	Underwear,	900	Guard all elevator openings by beveled protectors.	Complied.

327	Flour and Feed,	5	Guard by secure railing fly-wheel of engine.	Complied.
328	Knit Goods,	325	Guard all elevator openings by beveled protectors. Cover or sink flush all projecting set-screws in collars on shafting.	
329	Bridges,	380	Guard gearing of cutting shears in north end of truss building.	
330	Tinners and Lineman's Tools,	83	No orders.	
331	Steam-Fitters' Specialties,	9	Introduce and operate within three months from date of this order such appliances or devices as may be necessary to remove the excessive dust generated in polishing-room. Guard by secure railing fly-wheel of engine. Provide rubber or felt washers for emory wheels.	Complied.
332	Machine Forged Nuts,	90	No orders.	
333	Tinners' Machines and General Hardware,	208	Cover or sink flush all projecting set-screws in collars on shafting. Guard elevator openings by beveled protectors.	Complied.
334	Pocket Cutlery and Razors,	240	Cover or sink flush projecting set-screws in collars on counter-shaft in press room Guard elevator openings by beveled protectors.	Complied.
335	Flour, Feed, and Wood,	6	No orders.	
336	Laundry Work,	9	No orders.	
337	R. R. Repair Shop,	30	No orders.	
338	Laundry Work,	30	No orders.	
339	Iron,	175	Guard by boxing or secure railing rolling shaft in eight-inch mill. Provide better water-closet accommodations for employes.	Complied.
340	Bakery Goods,	18	No orders.	
341	Harnesses,	12	Thoroughly clean and disinfect water-closets and keep the same in good sanitary condition.	Complied.
342	Files,	7	No orders.	
343	Carriage Repairs,	15	No orders.	
344	Wood Work,	18	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
345	Vehicles,	152	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
346	Wire Goods,	119	Guard by boxing low shafting in buffing-room.	Complied.
			Clean and disinfect water-closet on top floor and keep the same in good sanitary condition.	
			Cover or sink flush all projecting set-screws in collars on shafting.	
347	Artificial Ice,	12	No orders.	
348	Electric Power,	5	No orders.	
349	Safety Pins,	7	No orders.	
350	Wood Working,	7	Provide hand-rail for stairway from first to second floor.	Complied.
			Extend flooring on second floor so as to securely guard main shaft.	
			Guard by boxing low pulley to band-saw.	
351	Ivory Buttons,	42	Provide better water-closet accommodations for employes.	
352	Thimbles,	18	Provide hangers for press belts to keep same from hanging on shafting when not in use	
353	Castings,	450	Thoroughly clean factory and keep same as clean as the nature of the business will permit.	Complied.
354	Shoe Needles,	47	No orders.	
355	Photo Apparatus,	50	Arrange exhaust system so as to remove the excessive dust generated by sand-wheels.	Complied.
			Guard low pulley to band saw.	
356	Bakery Goods,	10	No orders.	
357	Carriages,	5	No orders	
358	Laundry Work,	6	No orders	
359	Carriage Painting,	5	No orders.	
360	Wood Work,	7	No orders.	
361	Wagons,	5	No orders.	
362	Wood Work,	10	Guard by secure railing fly-wheel of engine.	Complied.
			Cover or sink flush all projecting set screws in collars on shafting.	
363	Castings,	45	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.
364	Crackers,	41	No orders.	

365	Cigars,	86	No orders.	
366	Locks,	35	Provide hangers for press-belts to keep same from running on shafting when not in use.	Complied.
367	Ruffles,	42	No orders.	
368	Light Hardware,	20	No orders.	
369	Cloth Buttons,	14	Provide more than one way of egress from fourth story by additional stairway on the inside or fire escape on the outside of building.	Complied.
370	Gas Stoves,	5	No orders.	
371	Wire Mattresses,	15	Provide better water closet accommodation for employes.	
			Repair roof on main building.	
372	Lithographing,	5	No orders.	
373	Corsets,	1,200	No orders.	
374	Machinery,	75	Thoroughly clean machine-room and keep same as clean as the nature of the business will permit.	Complied.
375	Table Cutlery,	325	Provide new cable to main elevator.	Complied.
			Guard all elevator openings by beveled protectors.	
			Provide better ventilation of water-closets for males.	
			Connect all dry polishing with exhaust system.	
			Guard driving-wheel to machine grinding stones.	
			Guard by railing raised platform in grinding-room.	
			Guard overhead gearing to drop-forges.	
			Overhead pulleys to Merrill drop-forges not to be cleaned while in motion.	
376	Light General Hardware,	153	Guard gears of wire benders in north end of bright wire-room.	Complied
			Remove projecting key in fly wheel of wire bender opposite water-closet.	
			Introduce and operate, within three months from date of this order, such appliances or devices as may be necessary to remove the excessive dust generated in grinding-room.	
			Cover or sink flush all projecting set-screws in collars on shafting.	
			Repair flooring in tumbler-room.	
			Prohibit any person under the age of sixteen years from having care or operating elevator.	
377	Carpenters' Tools,	412	Guard by secure railing idler running near floor in level-room.	Complied.
			Cover or sink flush projecting set screws in collars on shafting in planer-room.	

REPORTS OF INSPECTIONS — CONTINUED.

Order No	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
378	Butts, Hinges, Pumps, and Hardware,	160	Connect all dry grinding with exhaust system in grinding-room.	Complied.
			Guard elevator openings by beveled protectors.	
379	Casket Hardware,	105	Introduce and operate, within three months from date of this order, such appliances or devices as may be necessary to remove the excessive dust generated in the polishing-room.	In Process.
			Cover or sink flush projecting set-screws in collars on shafting on second and third floor, east end.	
			True up counter shaft, northeast corner, second floor.	
			Guard elevator openings by beveled protectors.	
			Provide more than one way of egress from fourth and third floor by additional stairs on the inside or fire escape on the outside of building.	
380	Rubber Tires,	325	Guard by secure railing driving-gears to large calendar machine in south end of grinding-room.	Complied.
			Guard by securely planking passage over low shafting, southwest side, in grinding-room.	
381	Bicycles,	215	Guard all elevator openings by beveled protectors.	Complied.
382	Printing, Embossing, and Envelope Presses,	68	No orders.	
383	Typesetting Machines,	103	Cover or sink flush projecting set-screws in collars on counter shaft, west side.	Complied.
			Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	
384	Matches,	89	No orders.	
385	Jobbing,	7	No orders.	
386	Sewing-Machine Fixtures,	53	Provide more than one way of egress from third floor by additional stairway on the inside or fire-escape on the outside of building.	Complied.
387	Steam Granite Work,	4	No orders.	

388	Steel Wire,	10	No orders.	
389	Paper,	32	Provide some suitable mechanical device whereby elevator car will be securely held in event of accident to shipper rope or hoisting machinery.	Complied.
390	Wood Work,	7	No orders.	
391	Electro-Plating,	10	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.
392	Fish-Hooks,	12	No orders.	
393	Light Hardware,	10	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.
394	Machine Work,	7	No orders.	
395	Laundring,	30	Provide more than one way of egress from fourth floor by additional stairway on the inside or fire-escape on the outside of building.	Complied.
396	Wood Patterns,	4	No orders	
397	Machinery,	8	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.
398	Stairs,	4	No orders.	
399	Wood Work,	10	No orders.	
400	Feed and Wood Work,	5	No orders.	
401	Builders' Hardware,	344	No orders.	
402	Light Hardware,	284	No orders.	
403	Machinery,	7	No orders.	
404	Castings,	44	No orders.	
405	Machinery,	18	No orders.	
406	Woolen Goods,	—	Not running.	
407	Light Hardware,	84	No orders.	
408	Flour and Feed, and Canning.	60	No orders.	
409	Wagon Wheels,	20	Securely guard fly-wheel to engine.	Complied.
410	Typewriters,	45	No orders.	
411	Steel Tubing,	117	Provide hand-rail to raised platform in annealing-room. Cover or sink flush projecting set-screws in collars on main shaft, east end, first floor, and on counter shaft, west end, first floor. Guard elevator openings by beveled protectors.	Complied.
412	Iron Bedsteads and Wire Mattresses.	99	No orders.	

REPORT OF INSPECTIONS — Continued.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
413	Printing,	4	No orders.	
414	Cigars,	38	Provide more than one way of egress from fourth and third floor by additional stairs on the inside or fire-escape on outside of building.	Complied.
415	Overalls and Shirts,	34	No orders.	
416	Printing,	5	No orders.	
417	Newspapers,	14	No orders.	
418	Machinery,	26	No orders.	
419	Wood Screws,	45	No orders.	
420	Braces and Hack-Saw Frames,	11	No orders.	
421	Machinery,	6	No orders.	
422	Electro-Plating,	6	No orders.	
423	Packing-Cases,	22	True up pulley on main shaft for wood saw, in basement. Remove projecting set-screw in driving pulley on main shaft for elevator. True up main shaft in basement. Box belts running through floor, first story.	
424	Steam Stone-Cutting,	10	Cover or sink flush projecting set-screw in collar on main shaft. Thoroughly clean water-closet and keep the same in good sanitary condition.	Complied.
425	Monuments,	5	No orders.	
426	Cabinet-Work & Moulding,	6	No orders.	
427	Wood-Planing,	56	No orders.	
428	Sashes, Doors, and Blinds,	12	Cover or sink flush all projecting set-screws in collars on main and counter shafting.	Complied.
429	Wood Work,	12	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.

430	Cabinet Work,	23	Cover or sink flush projecting set-screws in collars on main shaft, in basement.	Complied.
431	Ale and Porter,	6	No orders.	
432	Printing,	7	No orders.	
433	Pneumatic Tire Valves,	7	No orders.	
434	Valves and Special Machinery,	8	No orders.	
435	Special Machinery,	12	No orders.	
436	Special Machinery,	8	Cover or sink flush projecting set screw in collar on main shaft.	Complied.
437	Pocket Books,	28	Provide signal bell for elevator.	Complied.
			Guard elevator casing by beveled protectors.	
438	Knit Goods,	16	No orders.	
439	Paper Ruling,	4	No orders.	
440	Paper-Cutting and Printing,	10	No orders.	
441	Builders' Hardware,	5	No orders.	
442	Printing,	17	No orders.	
443	Index Books,	16	No orders.	
444	Printing,	10	No orders.	
445	Incandescent Lights,	28	No orders.	
446	Steam Heaters, Boilers, and Engines,	32	Guard elevator opening on fourth floor by bars or chains.	Complied.
447	Cornices,	23	No orders.	
448	Castings and Machinery,	150	No orders.	
449	Underwear,	76	No orders	
450	Mouldings,	14	Cover or sink flush projecting set-screws in collars on counter shafting.	Complied.
			Provide suitable water closet accommodation for employes.	
451	Cabinet Work,	20	Cover or sink flush projecting set-screws in collars on main shaft.	Complied.
			Provide suitable water-closet accommodation for employes.	
			Guard by railing outside platform near office.	
452	Carriage Hardware,	134	Securely guard freight elevator landing in basement.	Complied.
			Guard elevator openings by rails or bars to prevent crossing over automatic hatches.	
453	Carriages,	60	No orders.	
454	Carriages,	70	No orders.	

REPORT OF INSPECTIONS—Continued.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
455	Light Hardware,	87	Extend exhaust system in buffing and polishing-room to more effectually remove the excessive dust generated in said room. Provide better water-closet accommodation for employes and keep the same in good sanitary condition.	Complied.
456	Wood Work,	25	No orders.	
457	Wood Work,	70	No orders.	
458	Underwear,	60	No orders.	
459	Shoes,	17	No orders.	
460	Printing,	30	No orders.	
461	Steel Drills,	12	Provide better water-closet accommodation for employes and keep the same in good sanitary condition.	Complied.
462	Cloth Buttons,	30	No orders.	
463	Cigars,	10	No orders.	
464	Builders' Hardware,	72	Securely guard projecting bolts in plate-couplings on shafting in tempering-room. Guard by boxing pulley and belt to trimming-bench near doorway in spoon department. Thoroughly clean factory and keep the same as clean as the nature of the business will permit. Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
465	Buttons,	60	Guard by boxing shaft to buffing-bench. Guard all projecting set-screws in collars and bolts in plate-couplings on shafting.	Complied.
466	Brass and Copper,	5	No orders.	
467	Vehicles,	4	No orders.	
468	Machinery,	20	No orders.	
469	Dyeing and Cleaning,	72	No orders.	
470	Pretzels,	6	No orders.	
471	Paper Boxes,	175	Provide an additional water-closet for female employes. Cover or sink flush all projecting set-screws in collars on shafting.	Complied.

472	Harness Hardware,	203	Provide hangers for belts to keep same from running on shafting when not in use	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
			Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	
473		8	Provide better water-closet accommodation for employes in brass foundry.	Complied.
474	Infants' Garments,	25	No orders.	
475	Cigars,	61	No orders.	
476	Paper Boxes,	29	No orders.	
477	Lithographing,	12	No orders.	
478	Boots and Shoes,	21	Provide hand-railing to front stairway from third to fifth floor.	Complied.
479	Ornamental Wood Work,	38	Box low pulley to iron frame saw, second floor.	
			Cover or sink flush projecting set-screw in collar on counter shaft, over Young Bros. planer.	
			Guard by casing lower fly-wheel of band-saw.	
			Guard by boxing main belt running through floor, second story.	
			Cover or sink flush projecting set-screw in collar on counter shaft, first floor.	
480	Biscuit and Crackers,	27	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
481	Wood Work,	38	No orders.	
482	Cigar Boxes,	17	True up main shaft.	Complied.
483	Wood Work,	12	Thoroughly clean outside water-closet and keep the same in good sanitary condition.	Complied.
484	Sewing-Machines,	22	No orders.	
485	Electric Supplies,	26	No orders.	
486	Machinery,	12	No orders.	
487	Harness, Saddles, etc.	150	No orders.	
488	Insulators and Corkaline Handles,	65	Provide safety washers for emory-wheels.	Complied.
			Provide better ventilation in lower story.	
			Guard all elevator openings by beveled protectors.	
489	Eyelets,	10	No orders.	
490	General Jobbing,	26	No orders.	
491	Paper Boxes,	17	No orders.	
492	Laundring,	15	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
493	Silver and Plated Ware,	165	Guard by gate, rail, or chain elevator opening on first floor. Guard all elevator openings by beveled protectors.	Complied.
494	Exhaust Pipes,	25	No orders.	
495	Wagons,	23	Guard by railing hoist and stairway on second floor.	Complied.
496	Store and Saloon Fixtures,	18	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.
497	Packing-Boxes,	8	No orders.	
498	Horse-Shoe Nails,	165	Guard pulley on main shaft, west end of machine-shop, to keep belt from working off of same. Provide safety washers for emery wheels. Guard all elevator openings by beveled protectors.	Complied.
499	Wood Work,	24	No orders.	
500	Crochet and Special Machinery,	51	No orders.	
501	Drop Forgings,	4	No orders.	
502	Special Machinery,	15	No orders.	
503	Marine and Stationary Boilers,	7	No orders.	
504	Casket Hardware,	15	True up counter shafts for buffing-machines. Provide new bearings for buffing-wheel spindle, south side.	Complied.
505	Engineers' Supplies,	15	No orders.	
506	Silver and Plated Ware,	160	Guard pulley on main shaft in machine burnishing-room to prevent belt working off of same. Remove idle pulley from same shaft, east end of room. Provide hand rails to all principal stairways. Guard elevator openings by beveled protectors.	Complied.
507	Printing,	11	No orders.	
508	Knit Goods,	43	No orders.	
509	Special Machinery,	52	No orders.	

510	Feed Water Heaters and Pumps,	27	Guard end of main shaft by boxing, or cut off the same to hub of pulley.	Complied.
511	Chucks,	65	Guard by secure railing fly-wheel to engine.	Complied.
512	Electric Supplies,	150	Guard all elevator openings by beveled protectors.	Complied.
			Cover or sink flush projecting set-screws in collars on shafting, second floor.	
513	Insulated and Asbestos Goods,	55	Guard gearing of mixing-machines in mixing-room.	Complied.
			Box main driving-belt in mixing room.	
			Guard elevater opening, first floor in new building by gates, chains, or bars, and keep closed when elevator is away from same.	
			Guard all elevator openings by beveled protectors.	
			Guard by railing window over elevator-shaft, new building.	
514	Envelopes and Paper Bags,	70	No orders.	
515	Plumbers' Tools,	30	No orders.	
516	Builders' Hardware,	60	No orders.	
517	Carriage Hardware,	6	No orders.	
518	Printing,	15	No orders.	
519	Cigar Boxes,	5	Guard low shafting to frame-saw by securely boxing same.	Complied.
520	Reloading Implements,	14	No orders.	
521	Machinery,	15	Securely guard all elevator openings by self-closing gates, or automatic hatches securely guarded.	Complied.
522	Electric Plating,	5	No orders.	
523	Card Printing,	8	No orders.	
524	Iron and Steel Spoons,	8	No orders.	
525	Bolts,	50	No orders.	
526	Carriage Hardware,	40	Main shaft in forging-shop not to be oiled when in motion.	Complied.
			Clean and disinfect water-closet.	
527	Silk Braid,	14	No orders.	
528	Carriage Hardware,	60	No orders.	
529	Electric Power,	5	No orders.	
530	Door Keys,	35	No orders.	
531	General Iron Works,	40	No orders.	
532	Cement-Lined Pipes,	30	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
533	Buckles,	73	Securely cover or guard bolts in plate-couplings on main shaft.	Complied.
534	Printing,	7	Cover or sink flush projecting set-screws in collars on main shaft, first floor.	Complied.
535	Flavoring Extracts,	45	Provide more than one way of egress from fifth and fourth floors by additional stairway on the inside or fire escape on the outside of building. Guard elevator openings by beveled protectors. Prohibit any person under the age of sixteen years from having care of or operating elevator.	
536	Machinery Tools,	6	No orders.	
537	Chucks,	5	Provide safety washers for emery-wheels.	
538	Paper Boxes,	28	No orders.	
539	Jobbing and Repairing,	5	No orders.	
540	Brass Castings,	5	Provide more than one way of egress from third floor by additional stairway on the inside of fire-escape on the outside of buildings occupied by tenants.	Complied.
541	Mineral Water,	8	No orders.	
542	Copper Smithing,	12	No orders.	
543	Iron Castings,	21	No orders.	
544	Brass and Bronze Castings,	7	No orders.	
545	Leather Belting,	122	No orders	
546	Pins,	20	Guard projecting bolts in plate-couplings on main shaft in machine-shop.	Complied.
547	Brass Patterns,	5	No orders.	
548	Nail Pullers,	6	Cover or sink flush projecting set screws in collars on main shaft.	Complied.
549	Over-Gaiters and Leggings,	75	No orders.	
550	Cleaning and Dyeing,	40	No orders.	

551	Plumbers' Supplies,	10	Repair flooring in old building.	Complied.
			Cover or sink flush projecting set-screws in collars on main shaft in old building.	
552	Wood Patterns,	13	No orders.	
553	Machinery Tools,	11	No orders.	
554	Wood Work,	120	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.
			Guard by boxing lower fly-wheel of band saw.	
555	Lithographing,	25	No orders.	
556	Book-Printing and Binding,	160	Guard gears on sides of Gordon presses.	Complied.
			Guard projecting keys in fly-wheels of Hoe cylinder presses.	
			Guard elevator openings by beveled protectors.	
			Box driving-belt running through floor near door to water-closet and also provide substantial steps to said closet, in room oocupied by tenant.	
557	Electrotyping,	7	No orders.	
558	Saddlery Hardware,	15	No orders.	
559	Cotton and Wool Suitings,	70	Guard by cross-bars or chains door front of hoistway, second floor.	Complied.
			Clean and limewash ceilings in water-closets of first and second stories for card and weave-rooms.	
560	Car and Engine Repairing,	32	No orders.	
561	Sash, Doors, and Blinds,	13	No orders.	
562	Electric Power,	23	Cover or sink flush projecting set-screws in collars on main shaft in machine-room.	Complied.
563	Crackers,	86	Cover or sink flush projecting set-screws in collars on main shaft.	Complied.
564	Laundry Work,	12	No orders.	
565	Laundry Work,	13	No orders.	
566	Monuments and Head Stones,	15	No orders.	
567	Cotton Warp Cassimeres,	60	No orders.	
568	Spools,	43	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
569	Globes and Black Boards,	9	No orders.	
570	Machine Twist and Linings,	583	No orders.	
571	Silk Throwing,	174	No orders.	
572	Wash Silk,	19	No orders.	
573	Paper Boxes and Printing,	47	Guard by casing balance-wheel and projecting key on shaft of press. Cover or sink flush projecting set-screws in collars on main shaft. Furnish suitable ventilation in box-room, second floor.	Complied.
574	Bed Comfortables,	100	No orders.	
575	Cleaning and Dyeing,	9	Case main belt running through floor in wash-room, second floor. Guard by boxing gears to mangle-machine, second floor.	Complied.
576	Ship Building,	15	No orders.	
577	Ship Repairing,	55	No orders.	
578	Carriage Cloth,	105	No orders.	
579	Sashes, Doors, and Blinds,	30	No orders.	
580	Steam and Gas Fitting,	13	No orders.	
581	Iron Castings,	35	Provide better water-closet accommodation for employes.	Complied.
582	Oak Leather Belting,	30	No orders.	
583	Monuments,	15	No orders.	
584	Wood Work,	20	Guard projecting bolts in flange coupling on main shaft in machine-shop. Cover or guard by boxing projecting set-screw in collar near coupling on main shaft in machine-shop.	Complied.
585	Files and Rasps,	25	No orders.	

586	Casks,	38	Guard by secure iron railing upright engine.	
			Guard by wood rails main shaft running near tapering-machine.	
			Guard by boxing pulley and driving-belt to punching-machine.	
			Clean and disinfect male water-closets.	
587	Fancy Cassimeres,	100	No orders.	
588	Paper,	7	Guard by boxing main belt running through floor in stock-room, second floor.	Complied.
			Replace cross-bars at door near hoistway.	
589	Paper,	21	Guard main gears, near passageway by keeping doors closed and hooked.	Complied.
			Replace cross bars to large door in stock-room on second floor.	
			Extend guard-rail from stairs to fly-wheel near steam engine.	
			Repair floor near rotary rag-machine.	
			Cover or sink flush projecting set-screws in collars on counter shaft driving cutting-machine.	
590	Printing,	12	Guard by casing or railing balance-wheel to printing press.	Complied.
591	Monuments,	15	No orders.	
592	Ship and General Repairing,	310	Guard by boxing driving-pulley and belt in saw-mill.	Complied.
			Guard by rail or casing main belt in saw machine-room.	
593	Paper Cutters,	43	Cover or sink flush projecting set-screw in collar on main shaft in vitriol-room	Complied.
			Clean and disinfect, and replace covers in water-closets, in old building.	
594	Union Cassimeres and Cloaking,	60	No orders.	
595	Cotton and Linen Lines.	15	Guard by secure railing driving-pulley and belt to upright engine.	Complied.
			Cover or sink flush projecting set-screws in collars on main shaft.	
			Guard by boxing pulley and belt to dresser-machine.	
			Guard by casing pulleys and belts to railways.	
596	Silex,	12	Provide such connection with exhaust system as may be necessary to remove the excessive dust from the atmosphere in bolting and dry-rooms	Complied.
			Guard by iron rail balance-wheel to pump engine.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
597	Woolen Suitings,	110	Guard by rails, gates, or chains, all elevator openings, and keep closed when elevator car is away from same.	P. ?
			Cover or sink flush all projecting set-screws in collars on main shaft in dresser room.	
			Guard by casing main driving-belt and opening in floor in wheel-room.	
598	Electric Power,	11	Guard by secure iron railing all main driving-pulleys to dynamos.	Complied.
599	Fancy Worsteds,	48	No orders.	
600	Stair Building,	5	No orders.	
601	Harness Hardware,	150	Prohibit any person under the age of sixteen years having the care, custody, or management of any elevator in your factory.	Complied.
602	Vehicles,	58	No orders.	
603	Boilers,	21	No orders	
604	Wood Work,	15	Clean and disinfect water-closets and keep the same in good sanitary condition.	Complied.
605	Wood Work,	25	Guard all projecting bolts in plate-couplings.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
606	Coach Lamps,	14	Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	Complied.
607	Axles.	5	No orders.	
608	Corsets,	190	Guard all elevator openings by gates or bars and keep closed when elevator car is away from same.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
609	Planers,	20	Put gate at elevator opening on third floor in proper working order, and keep closed when elevator car is away from same.	Complied.
			Guard low pulley to band-saw.	
610	Carriage Bolts,	50	No orders.	

611	Cotton,	250	Guard all elevator openings by good safety-gates and keep them closed when elevator is away from same.	Complied.
			Cover or sink flush all projecting set screws in collars on shafting.	
			Thoroughly clean factory and keep the same as clean as the nature of the business will permit.	
612	Iron Castings,	38	Thoroughly clean and disinfect outside water-closet and keep the same in good sanitary condition.	Complied.
613	Rubber,	40	Securely guard projecting bolts in plate-couplings on light shafting.	
614	Pins,	138	No orders.	
615	Paper,	90	Securely guard all elevator openings to screen room elevator in pulp factory.	Complied.
			Guard by boxing all belts running through floors in pulp factory.	
616	Carriage Hardware,	70	No orders.	
617	Buttons,	60	No orders.	
618	Silver Plated Ware,	90	Replace boxing to pulley over stairway.	Complied.
619	Pianos,	40	No orders.	
620	Straw Hats,	206	Guard elevator openings by gates, bars, or chains, and keep closed when elevator is away from same.	Complied.
621	Shoes,	124	No orders.	
622	Electric Supplies,	44	No orders.	
623	Pianos and Organs,	203	No orders.	
624	Plumbers' Supplies,	480	Provide some system for the better ventilation in plating-room.	Complied.
625	Vehicles,	75	Thoroughly clean body-making room and keep the same as clean as the nature of the business will permit.	Complied.
626	Patent Medicine,	21	No orders.	
627	Carriages,	45	No orders.	
628	Refining,	6	No orders.	
629	Machinery,	25	No orders.	
630	Vehicles,	50	No orders.	
631	Beer,	18	No orders.	
632	Wood Work,	12	Clean and disinfect outside water-closet and keep the same in good sanitary condition.	Complied.
633	Wood Work,	8	No orders.	
634	Stairs,	5	No orders.	
635	Wood Work,	5	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
636	Brass Goods,	500	Securely guard plate couplings on shafting, first floor, stone building.	Complied.
			Thoroughly clean rolling-mill water-closet and keep same in good sanitary condition.	
637	Vehicles,	6	No orders.	
638	Wood Work,	21	Guard projecting set-screw in collar on main shaft.	
			Guard low pulley to band-saw.	
639	Printing,	5	No orders.	
640	Printing,	16	No orders.	
641	Paper Boxes,	75	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
642	Metal Buttons,	25	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
643	Game Traps and Cow Bells,	12	No orders.	
644	Machinery,	65	No orders.	
645	Blank Books,	14	No orders.	
646	Machinery,	30	No orders.	
647	Band-Saws,	5	No orders.	
648	Feed Water Heaters,	15	No orders.	
649	Fancy Pottery,	60	No orders.	
650	Silk and Velvets,	1,950	No orders.	
651	Card-Board,	16	Guard gears of calendar-machines where suggested.	Complied.
			Cover or sink flush projecting set-screws in collars on main shaft at water-wheel.	
652	Cutlery,	149	Introduce and operate, within three months from date of this order, such appliances or devices as may be necessary to remove the excessive dust generated in dry polishing and buffing-rooms.	Complied.
			True up main shaft in C. Hart's room.	
			Guard elevator openings by gates, bars, or chains, and keep closed when elevator is away from same.	
			Provide new cable for elevator.	
653	Writing-Paper,	80	No orders.	

654	Bolts, Nuts, and Rules,	200	Overhead pulleys to drop-forges not to be cleaned while in motion.	Complied.
			Guard elevator landing, first floor, at annealing room, by cross-bars or chains to prevent crossing under elevator car.	
655	Cotton Batting,	17	No orders.	
656	Wood-Work,	4	No orders.	
657	Wood-Turning,	6	No orders.	
658	Mouse Traps,	6	Cover holes in flooring near water-wheel.	Complied.
659	Manilla Paper,	27	Guard elevator opening by beveled protector.	Complied.
660	Hardware and Paper Boxes,	10	True up main shaft, first floor.	Complied.
			Guard projecting bolts in plate-couplings on main shaft, first floor.	
661	Case-Hardened Nuts,	8	Cover or sink flush projecting set-screws in collars on counter shafting, northeast side.	Complied.
662	Copying-Books and Paper,	31	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
			Securely guard gears to rotary-machine.	
663	Fancy-Colored Paper,	20	Introduce and operate, within three months from the date of this order, such appliances or devices as may be necessary to remove the excessive dust generated in the cutter-room.	
			Guard gears of shaving duster.	
			Replace cross-bars to doors at hoistway when said hoistway is not in use.	
664	Copying and Manilla Paper,	30	Securely guard driving-gears to paper machines.	Complied.
665	Card-Board,	7	No orders.	
666	Book and Printing Paper,	70	No orders.	
667	Underwear,	100	Cut off projecting keys on wool scouring-machines.	Complied.
			Guard gears on card-machines where suggested.	
668	Underwear,	63	No orders.	
669	Wood-Work,	11	Guard low pulley to band-saw.	Complied.
670	Screws,	15	Provide safety washers for emery-wheels.	Complied.
671	Dynamos,	91	Guard elevator landing, first floor, in wash-room, to prevent crossing under elevator car.	Complied.

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
672	Manilla Paper,	45	Introduce and operate, within three months from date of this order, such appliances or devices as may be necessary to remove the excessive dust generated in cutter-room.	Complied.
			Cover or sink flush projecting set-screw on counter shaft to stuff-pump.	
			Guard by railing raised platform at stuff-pump.	
			Guard elevator openings by beveled protectors.	
673	Woolen Goods,	130	Cover or sink flush all projecting set-screws in collars on shafting.	
			Securely guard quarter-gears on spinning-machines.	
			Box belts running through floor in card-room.	
674	Binders' Paper,	106	Securely guard overhead gears at south end of paper-machine room.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
			Securely guard gears to water-wheel	
			Replace boxing to driving belts running through floor in stock-room.	
675	Book and Envelope Paper,	90	Securely guard gears to paper-machines where suggested.	Complied.
676	Writing-Paper,	54	No orders.	
677	Cloaking,	43	Cover or sink flush projecting set-screw in collar on shafting in dye-house.	Complied.
			Put guard three inches high around wheel-pit of engine.	
			Provide new cable to elevator and prohibit any riding on elevator.	
			Provide gate to elevator landing and keep closed when elevator is away from same.	
678	Dress Stays,	70	Provide more than one way of egress from third floor by additional stairway on the inside of fire-escape on the outside of building.	
679	Corsets,	56	Provide more than one way of egress from third floor by additional stairway on the inside of fire-escape on the outside of building.	
			Guard all elevator openings by gates, bars, or chains, and keep closed when elevator is away from same.	
680	Combs,	55	No orders.	
681	Pins,	40	No orders.	

682	Lamp Goods,	40	No orders.	
683	Paper Boxes,	100	No orders.	
684	Bolts and Tacks,	125	No orders.	
685	Brass Goods,	225	Provide guard-rail to outside door second floor, south mill.	Complied.
			Guard gears to three roll straightener in rolling mill.	
686	Brass and Iron Bedsteads,	102	No orders.	
687	Underwear,	130	No orders.	
688	Printing-Presses,	95	No orders.	
689	Paper Boxes,	11	No orders.	
690	Files.	5	No orders.	
691	Machinery,	112	No orders.	
692	Pianos and Organs,	285	Put gates at all elevator openings in good working order and keep closed when elevator is away from same.	Complied.
693	Feldspar,	16	No orders.	
694	Book Paper,	250	Cover or sink flush projecting set screws in collars on shafting in wheel-pit.	Complied.
			Guard by railing driving-wheels in basement where suggested.	
			Guard projecting set-screws in collars on water-wheel shafting.	
			Guard projecting bolts in plate-couplings, in repair shop.	
			Cover or sink flush projecting set-screws in collars on shafting in feed-room.	
695	Paper and Carpet Machinery,	12	No orders.	
696	Chucks.	24	Guard by railing pulley at water-wheel as suggested.	Complied.
697	Cotton Warps,	200	Guard elevator openings to main elevator by beveled protectors.	Complied.
			Guard projecting bolts in plate-couplings on main shaft on second, third, and fourth floors.	
			Remove projecting set-screw on low shaft to cotton-picker.	
			Guard low pulley to band-saw.	
698	Tissue Paper,	46	Introduce and operate, within three months from date of this order, such appliances or devices as may be necessary to remove the excessive dust generated in cutter-room.	Complied.
			Cover or sink flush projecting set-screws in collars on shafting in engine-room.	
699	Gin,	9	No orders.	

REPORT OF INSPECTIONS—Continued.

Order No.	Goods Manufactured.	No. of Employes	Orders Given.	Compliances.
700	Embroidery and Sewing-silk,	175	No orders.	
701	Novelty Yarns,	85	Guard elevator openings by beveled protectors. True up two pulleys in spinning-room.	Complied.
702	Tissue Paper,	14	Introduce and operate within three months from date of this order such appliances or devices as may be necessary to remove the excessive dust generated in cutter-room. (Property and mill rights have changed hands.)	
703	Sewing-Silk,	40	Guard by secure railing driving-wheel to engine. Guard projecting bolts in plate-couplings on shaft in doubling-room.	Complied.
704	Hand Trucks,	18	Guard low pulley to band-saw. Cover or sink flush projecting set-screw in collar on shafting in basement.	Complied.
705	Colored and Tissue Paper,	70	Guard overhead gearing in machine-room where suggested.	Complied.
706	Underwear,	190	No orders.	
707	Novelties and Electro-Plating,	7	No orders.	
708	Saddlery Hardware,	40	True up pulley on main shaft in press-room. True up wooden pulley on counter shaft in basement.	Complied.
709	Brass Castings,	8	No orders.	
710	Feed and Flour,	8	No orders.	
711	Light Metal Goods,	21	No orders.	
712	Rivets and Castors,	40	True up main shaft in press-room.	Complied.
713	Castors,	7	True up main shaft. True up pulley on counter shaft.	Complied.
714	Underwear,	150	Guard by beveled protectors elevator openings of main elevator.	Complied.
715	Machine Tools,	8	No orders.	
716	Wood-Sawing,	9	No orders.	
717	Cloakings,	150	Guard elevator openings by beveled protectors.	Complied.

718	Woolen Unions,	118	No orders.	
719	Card-Board,	15	No orders.	
720	Paper Binding Board,	8	No orders.	
721	Soap,	75	Box driving-belt furnishing power to new building.	Complied.
			Cover or sink flush projecting set-screws on counter shaft in new building.	
			Guard elevator openings in upper factory by beveled protectors.	
722	Card-Board,	8	Guard by secure railing fly-wheel to engine.	Complied.
			Cover or sink flush projecting set-screws in collars on low shafting to paper-machine.	
723	Sterling Silver Ware,	15	Guard by casing, three feet high, wheel-pit to engine.	Complied.
724	Cutlery and Plated Ware,	75	Introduce and operate within three months from date of this order such appliances or devices as may be necessary to remove the excessive dust generated in trimming and buffing-rooms.	
725	Boxes,	10	No orders.	

Inspections and Orders from July 1, 1894, to September 30, 1895.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances
1	Lime,	25	No orders.	
2	Lime,	20	No orders.	
3	Pig Iron,	25	Guard driving gears to blowing cylinders by continuation of rail to center of shaft, on both sides in engine-room, upper furnace. Guard by casing, driving belt to planer to the height of pulley in saw-mill.	Complied.
4	Lime,	18	No orders.	
5	Sash, Doors, and Blinds,	4	Cover or sink flush projecting set-screws in collar on variety machine. Guard belt driving sanding machine by proper casing.	Complied.
6	Pocket Cutlery,	39	Guard belt running from cutlers to matching-room by casing three feet in height. Case, or provide railing, to protect pulleys and belts at drill in upper cutler's room.	Complied.
7	Rules,	19	No orders.	
8	Cutlery Handles,	14	No orders.	
9	Car Castings,	50	Guard fly-wheel and belting by railing three feet in height in new foundry and machine shop. Guard fly-wheel and belting by railing three feet in height, beginning at partition on east side and running around saw bed.	Complied.
10	Castings,	30	No orders.	
11	Shears and Scissors,	18	Provide substantial hand-rail around driving belt in store-room, at least three feet in height, extending rail around horizontal pulleys over wheel-pit. Case to a height of three feet, belt running through floor from cider mill in store-room.	Complied.

12	Laundring,	6	Guard driving belt by casing three feet in height on first floor.	Complied.
13	Sash, Doors, and Blinds.	4	Guard doorways by cross-bars on second floor.	Complied.
14	Paper Boxes,	17	No orders.	
15	Hats,	200	No orders.	
16	Castings and Machinery	6	No orders.	
17	Paints and Wood Filler	50	Box belts running packer in north end of silex mill to height of three feet.	Complied.
18	Crockery,	46	No orders.	
19	Knives,	81	Box main belt in cork-screw room to the height of three feet. Box main shaft in wheel-pit. Provide secure hand-rail to stairs leading from yard to manicure room.	Complied.
20	Tanned Sheep Skins,	6	Guard driving belt to force pump by secure railing.	Complied.
21	Tanned Sheep Skins,	6	No orders.	
22	Edge Tools.	50	No orders.	
23	Brass Specialties,	55	No orders.	
24	Silk.	145	No orders.	
25	Carriage Springs,	6	No orders.	
26	Turned Wood Work,	16	Case driving belt to saw-room, first floor, by proper casing.	Complied.
27	Brass Specialties,	30	No orders.	
28	Spectacle and Eye Glasses,	12	No orders.	
29	Machinery and Iron Castings,	4	No orders.	
30	Wood Work,	5	No orders.	
31	Castings,	5	No orders.	
32	Knit Goods,	105	Guard by secure railing, belt running from engine to dynamo. Guard on both sides alike, main driving belt in engine-room as suggested.	Complied.
33	Pins,	90	Guard doorway on second floor in shipping-room by cross-bars or chains.	Complied.
34	Undertakers' Goods,	30	No orders.	
35	Undertakers' Goods,	94	No orders.	
36	Underwear,	157	No orders.	
37	Clocks,	300	No orders.	
38	Book and Job Printing,	12	No orders.	
39	Bolts,	70	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
40	Horn Buttons,	20	Guard by secure railing, stairway opening on second floor.	Complied.
41	Horn Combs,	11	No orders.	
42	News Papers,	7	No orders.	
43	Seamless Hosiery,	8	No orders.	
44	Cotton Hosiery,	28	No orders.	
45	Leather Supplies,	22	No orders.	
46	Rubber Goods,	277	Guard by secure railing, cross-belt in rag-washing-room, Mill No. 1.	Complied.
			Guard by proper casing, belts to grinding mills in Mill No. 1.	
47	Lime,	6	No orders.	
48	Shears and Scissors,	8	No orders.	
49	Cotton Cloth,	210	Clean and disinfect water-closets, and keep the same in good sanitary condition.	Complied.
			Put gates at elevator openings in proper working order, and keep closed when elevator is away from same.	
50	Cotton Cloth,	80	Guard main belt in slasher-room by secure iron or wood railing four feet in height.	
			Provide some suitable mechanical device whereby the elevator car will be securely held in event of accident to shipper rope or hoisting machinery.	
51	Cotton Cloth,	68	Remove wooden conductor pipe of water-closets and replace by iron soil pipe, connect said pipe with flush bowls, and provide seats for same, and keep said closets in good sanitary condition.	In process.
			(Notified selectmen of insufficient egress from building.)	
52	Woolen Goods,	80	No orders.	
53	Flour and Feed,	5	Box main belt on first and second floor to the height of three feet from floor.	Complied.
54	Underwear,	49	No orders.	

55	Straw Board,	26	Guard belting near paper machine on first floor by casing in at least three feet from top of steps. Guard belt near beater-room, close to force pump, by casing five feet in height from floor.	Complied.
56	Cotton Cloth,	30	No orders.	
57	Cotton Cloth,	28	Cover or sink flush all projecting set-screws in collars on shafting. Provide some suitable mechanical device whereby the elevator will be securely held in event of accident to shipper rope or hoisting machinery.	
58	Cotton Cloth,	27	Thoroughly clean and disinfect water-closets, repair the same, and keep in good sanitary condition. Box gears on mules, (not now in operation,) before the same are used again. Provide some suitable mechanical device whereby the elevator will be securely held in event of accident to shipper rope or hoisting machinery.	
59	Bobbins and Wood Turning,	7	No orders.	
60	Satinets,	35	Cover or sink flush all projecting set-screws in collars on shafting. Thoroughly clean and disinfect water-closets, and keep the same in good sanitary condition. Provide some suitable mechanical device whereby the elevator will be securely held in event of accident to shipper rope or hoisting machinery.	
61	Woolen Yarn,	28	No orders.	
62	Crucibles,	26	No orders.	
63	Suspender Webbing,	100	No orders.	
64	Paper Boxes,	88	Cover or sink flush projecting set-screws on Inman stripper.	Complied.
65	Razors and Knives,	37	No orders.	
66	Velvets,	320	Cover or sink flush projecting set-screws in collars on shafting of seven picking machines, in picking, dressing, winding, and spooling rooms.	Complied.
67	Cotton Ducking,	115	No orders.	
68	Planes and Rules,	125	No orders.	
69	Hosiery,	13	Guard doorway opening on second floor by cross-bars.	Complied.

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
70	Brushes.	50	Guard against accident by continuance of rack for safety catch in elevator shaft from first to second floor.	Complied.
71	Cotton Duck,	350	No orders.	
72	Cotton Duck,	360	Box belt running through floor in lapping-room to the height of four feet.	Complied.
73	Yarn,	50	No orders.	
74	Cotton Duck,	30	Box belt in twisting-room to the height of four feet from floor.	Complied.
75	Rules,	75	No orders.	
76	Tissue Paper,	4	Box belt to ream cutter, covering up opening in floor of first story.	Complied.
77	Wood Turning,	..	Guard main driving belt in basement, and counter belts driving planer, buzz planers, and variety machines, by proper bridging.	Complied.
78	Laundring,	9	No orders.	
79	Ladies' and Children Shoes,	70	No orders.	
80	Woolen Underwear,	60	No orders.	
81	Sewing Silk,	60	No orders.	
82	Plated Ware,	200	No orders.	
83	Iron and Brass Castings,	175	Thoroughly clean and repair outside water-closets and keep the same in good sanitary condition.	
			Introduce and operate within three months from date of this order such appliances or devices as may be necessary to secure such ventilation as shall remove the excessive fumes of acid, and steam generated in dip-room.	
84	Casters,	20	No orders.	
85	Hardware Specialties,	16	Guard by railing belt running through floor in tumbling-room.	Complied.
			Cover or sink flush all projecting set-screws in collars on main shafting.	
86	Brass Specialties,	200	Building inspector notified of insufficient egress and escape from building.	
87	Paper,	20	No orders.	
88	Brick,	18	Guard by boxing main driving-belt at passageway, as suggested.	Complied.

89	Brick,	20	No orders.	
90	Silk,	157	No orders.	
91	Woolen Goods,	320	No orders.	
92	Wood Work.	12	No orders.	
93	Cotton Cloth,	128	Thoroughly clean and disinfect water-closets and keep the same in good sanitary condition.	Complied.
			Provide some suitable mechanical device whereby the elevator will be securely held in event of accident to shipper rope or hoisting machinery.	
			Selectman notified of insufficient egress and escape from building.	
94	Cotton Cloth,	52	Thoroughly clean and disinfect water-closets and keep the same in good sanitary condition.	Complied.
			Provide some suitable mechanical device whereby the elevator will be securely held in event of accident to shipper rope or hoisting machinery.	
95	Cotton Cloth,	168	No orders.	
96	Cotton Cloth,	119	Provide some suitable mechanical device whereby the elevator will be securely held in event of accident to shipper rope or hoisting machinery.	Complied.
97	Shoes,	25	No orders.	
98	Paper and Wood Boxes,	10	Guard outside doorways on second floor by cross-bars and keep same in place when not in actual use.	Complied.
			Guard elevator opening on second floor by gates, bars, or chains, and keep closed when elevator is away from same.	
99	Sewing Silk,	40	No orders.	
100	Electro-Plating,	6	No orders.	
101	Sash, Doors, and Blinds,	31	No orders.	
102	Soap,	20	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
103	Boilers and Tanks,	16	No orders.	
104	Trucks and Carriages,	30	Cover or sink flush all projecting set-screws in collars on shafting furnishing power for blower.	Complied.
105	Sash, Doors, and Blinds,	150	Cover or sink flush all projecting set-screws in collars on shafting in boxing and turning-rooms.	Complied.
106	Spoons and Shears,	127	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
107	Brass Goods,	750	Cover or sink flush projecting set-screw in collar on main shaft in stamp-room, and in room No. 17 on shaft near perforating-machine.	Complied.
108	Carpets,	150	No orders.	
109	Brass Goods,	8	Cover or sink flush projecting set-screw in collar on main shaft, first floor.	Complied.
110	Casket Trimmings,	12	Cover or sink flush projecting set-screw in collar on shafting near buffing machine.	Complied.
111	Boilers and Engines,	100	Cover or sink flush all projecting set-screws in collars on main shaft, first and second floor.	Complied.
112	Beer,	21	No orders.	
113	Corset Machinery,	15	Cover or sink flush projecting set-screw on main shaft in upper room.	Complied.
114	Emery Wheels,	9	No orders.	
115	Shears,	53	No orders.	
116	Chains,	35	No orders.	
117	Wire Springs,	20	No orders.	
118	Hardware Specialties,	47	Cover or sink flush projecting set-screw in collar on shaft running tumbling-barrels.	Compiled.
119	Silver Flat Ware,	300	Cover or sink flush projecting set-screw in collar on shaft above cross-roller in basement.	Complied.
120	Sewing-Machines,	1,290	Guard by boxing belt on burnishing-machine near clothes closet. Guard by boxing belt to grooving-machine in needle-room. Guard by boxing shaft on south side of needle-room under grooving-machine.	Complied.
121	Electro-Plating,	14	Provide better ventilation by keeping blower in proper working order.	Complied.
122	Shirts,	9	No orders.	
123	Harness,	27	Guard rear door on third floor by cross-bars.	Complied.
124	Novelties,	25	Cover or sink flush all projecting set-screws in collars on main shaft in buffing-room.	Complied.
125	Machine Forging,	6	No orders.	
126	Belting,	18	No orders.	

127	Rubber Reclaiming,	2	No orders, "not running full force."	
128	Corsets,	315	Cover or sink flush all projecting set-screws in collars on main shaft in finishing-room.	Complied.
129	Steam Guages,	100	No orders.	
130	Pocket Cutlery,	50	No orders.	
131	Machinery,	80	No orders.	
132	Cartridges,	1025	No orders.	
133	Plumbers' Supplies,	768	Cover or sink flush all projecting set-screws in collars on shafting in machine shop.	Complied.
134	Carriages,	126	Cover or sink flush projecting set-screws in collars on main shaft in saw-room.	Complied.
135	Machinery and Castings,	30	No orders.	
136	Slippers,	7	No orders.	
137	Shoes,	65	No orders.	
138	Doors, Sash, and Blinds,	12	No orders.	
139	Cotton Cloth,	225	Provide some suitable mechanical device whereby the elevator will be securely held in event of accident to shipper rope or hoisting machinery.	In process.
140	Wood Patterns,	10	No orders.	
141	Pressed Paper Boxes,	22	No orders.	
142	Wood Work,	25	No orders.	
143	Mouldings,	14	No orders.	
144	Steel Dies,	10	No orders.	
145	Carriage Hardware,	50	No orders.	
146	Newspapers,	26	No orders.	
147	Machine Tools,	85	Cover or sink flush projecting set-screws in collar on main shaft, near friction clutch, in main building.	Complied.
			Adjust elevator gate in basement so that it will work freely.	
			Cover or sink flush projecting set-screws in collars on main shaft in basement of wing.	
148	Mechanical Toys,	34	No orders.	
149	Hardware,	50	Cover or sink flush projecting set-screws in collars on main shaft in polishing-room.	
150	Malleable Iron Castings,	501	Cover or sink flush projecting set-screws in collars on shafting in carpenters' and tumbling-rooms.	Complied.
151	Corsets,	700	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
152	Rubber Goods,	39	No orders.	
153	Furniture Trimmings,	178	Cover or sink flush projecting set-screws in collars on main shaft in tumbling-room and in new addition.	Complied.
154	Rubber Goods,	60	Box gearing on rubber calendar in basement.	Complied.
			Provide railing between mixing mills to prevent passing between same.	
			Put elevator gate in good working order, and keep closed when elevator is away from same.	
155	Hardware Specialties,	76	Introduce and operate within three months, from date of this order, such appliances or devices as may be necessary to provide such ventilation as will remove the excessive steam and acid fumes from dip-room.	
156	Cotton Cloth,	160	No orders.	
157	Cotton Cloth,	734	No orders.	
158	Cotton Cloth,	75	No orders.	
159	Woolen Goods,	45	Thoroughly clean and repair both inside and outside water-closets, and keep the same in good sanitary condition.	Complied.
160	Cotton Cloth,	200	No orders.	
161	Woolen Goods,	12	Guard by boxing main belt on second floor to the height of four feet from floor.	
			Guard by substantial railing, stairway opening on first floor.	
			Provide suitable water closet accommodation for male and female operatives.	
162	Cotton Cloth,	230	Provide some suitable mechanical device whereby the elevator cars will be securely held in event of accident to shipper rope or hoisting machinery.	Complied.
			Guard elevator opening on second floor in press-room by gate, bar, or chains, and keep closed when elevator is away from same.	
			Thoroughly clean and disinfect water-closets, and keep the same in good sanitary condition.	

163	Cotton Cloth,	100	Provide separate water-closets for female operatives on first and second floors.	Complied.
164	Cotton Cloth,	80	Provide some suitable mechanical device whereby the elevator cars will be securely held in event of accident to shipper rope or hoisting machinery.	Complied.
			Provide separate water-closet accommodation for female operatives on each floor	
165	Licorice and Dye Stuffs,	260	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
			Guard by secure railing driving-wheel and belt of large cutter-engine.	
			Guard by secure railing crank and fly-wheel in building No. 1.	
166	Britannia Ware,	1000	No orders.	
167	Can Openers and Door Bells.		No orders.	
168	Paper Boxes,	31	No orders.	
169	Metal Goods,	230	No orders.	
170	Gas Fixtures, Lamps, and Art Goods,	725	No orders.	
171	Cut Glass,	121	Guard by secure railing, three feet in height, fly-wheel to engine.	Complied.
			Cover or sink flush all projecting set-screws in collars on main shafting on third and fourth floors.	
172	Granite and Plated Ware	162	No orders.	
173	Brass Goods,	600	Cover or sink flush projecting set-screws in collars on shafting on third and fourth floors, section No. 5.	Complied.
			Guard driving belt and pulley to slitting-machine in section No. 2 of attic, as suggested.	
174	Cutting Nippers,	4	No orders.	
175	Curtains,	410	No orders.	
176	Hardware,	300	Cover or sink flush projecting set-screws in collars on main shaft in screw department.	
			Guard by cross-bars elevator openings to prevent operatives crossing over automatic hatches.	
177	Steel Pens and Cutlery,	250	Introduce and operate within three months from the date of this order such appliances or devices as may be necessary to remove the excessive dust generated in handle finishing-room of main building.	
178	Silver Plated Ware,	200	No orders.	
179	Woolen Goods,	200	No orders.	

REPORT OF INSPECTIONS—CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
180	Brass Goods,	6	Cover or sink flush projecting set-screws in collars on main shaft. Guard elevator opening by keeping bar down when elevator car is away from same. Repair water-closet soil pipes so that bowl can be flushed and kept in good sanitary condition.	Complied.
181	Shoe Buckles,	25	Guard elevator opening by keeping bar down when elevator car is away from same.	Complied.
182	Brass Goods,	60	No orders.	
183	Wheel and Carriage Parts,	30	Guard by gates, bars, or chains all elevator openings, and keep closed when elevator is away from same.	Complied.
184	Elastic Web Goods,	175	No orders.	
185	Coach Trimmings,	30	No orders.	
186	Metal Planing,	6	No orders.	
187	Electric Power,	12	No orders.	
188	Lathes,	5	No orders.	
189	Novelty Goods,	8	No orders.	
190	Carriage Springs,	40	No orders.	
191	Newspapers,	9	No orders.	
192	Wood Work,	10	No orders.	
193	Gas and Electric Light,	5	No orders.	
194	Hatters' Fur,	140	No orders.	
195	Pianos,	25	Guard by secure railing fly-wheel to engine.	Complied.
196	Straw and Felt Hats,	325	No orders.	
197	Castings,	9	No orders.	Complied.
198	Cotton and Wool Underwear,	100	Guard by iron-railing belt on second floor.	
199	Cotton Cloth,	18	No orders.	
200	Dyeing,	150	Guard open space over butte-room by partition or railing across second floor.	Complied.

201	Candle Wicking,	15	Box main belt on second floor.	Complied.
			Provide suitable water-closet accommodation for male and female employes.	
202	Cotton Cloth,	190	No orders.	
203	Cotton Cloth,	23	Thoroughly clean and disinfect water-closets, and keep the same in good sanitary condition.	Complied.
204	Cotton Cloth,	260	No orders.	
205	Cotton Yarn,	100	No orders.	
206	Cotton Cloth,	680	No orders.	
207	Cotton Cloth,	175	No orders.	
208	Sheet Steel Goods,	126	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
209	Silverware,	62	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
210	Typewriters,	7	No orders.	
211	Graphophones,	56	No orders.	
212	Silks,	140	Cover or sink flush all projecting set-screws in collars on main shafting.	
			Provide two additional water-closets for male and female operatives.	
213	Piano and Organ Hardware,	45	No orders.	
214	Embroidered Flannels,	30	Cover or sink flush all projecting set-screws in collars on shafting in east end of building.	Complied.
215	Organs,	51	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
216	Corsets,	83	No orders.	
217	Machine Work,	8	No orders.	
218	Machinery,	50	Guard elevator openings by keeping gates closed when elevator is away from same.	Complied.
			Thoroughly clean and repair water-closets on third floor and keep the same in good sanitary condition.	
219	Silk Goods,	150	No orders.	
220	Silk,	100	Guard by secure iron railing crank and piston-rod of engine.	
			True up main shaft and pulley on upper floor.	
221	Electric Power,	5	No orders.	
222	Cotton Cloth,	220	No orders.	
223	Castings,	15	Cover or sink flush projecting set-screws in collars on main shaft in engine room.	Complied.
224	Doors, Sash, and Blinds,	26	No orders,	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
225	Silk Machine-Twist,	108	No orders.	
226	Doors, Sash, and Blinds,	22	No orders.	
227	Laundring,	10	Provide a separate water-closet for female employes.	Complied.
228	Thread,	144	No orders.	
229	Thread,	901	Guard elevator openings in dye-house and on first floor in the rear of tower of main building, by adjusting gates so as to be self-closing.	Complied.
230	Thread,	83	Guard elevator opening on second floor by gates, bars, or chains, and keep closed when elevator is away from same.	Complied.
231	Thread,	389	Guard by secure iron railing both sides of dynamo driving belt in basement.	Complied.
232	Spools,	51	No orders.	
233	Woolen Goods,	150	Cover or sink flush projecting set-screws in collars on shafting in scouring-room.	Complied.
234	Wood Type,	7	No orders.	
235	Paper Machinery,	50	No orders.	
236	Cotton Buffs,	15	No orders.	
237	Bedquilts,	180	No orders.	
238	Woolen Goods,	115	Cover or sink flush all projecting set-screws in collars on shafting in engine-room.	Complied.
239	Cotton Cloth,	125	Guard by boxing, or railing four feet high, main belt in picker-room.	Complied.
			Thoroughly clean and repair water-closets and keep the same in good sanitary condition.	
			Provide a three inch crinkle in eye-bolt to elevator for rope to pass through.	

240	Cotton Cloth and Shirting,	503	Provide new flooring in upper wheel-room and cover open space by trap door or movable floor.	Complied.
			Thoroughly clean water closets in carding-room building and keep the same in good sanitary condition.	
			Cover portion of floor in upper engine-room, over main belt, extending as far back as iron railing.	
			Securely guard driving-pulley and belt in upper engine-room, by running a base-board, one foot high, around iron railing; extend said railing up over main shaft to wall.	
			Provide some suitable mechanical device whereby elevator cars in lapper and carding-rooms will be securely held in event of accident to shipper rope or hoisting machinery.	
241	Electric Specialties,	81	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
242	Machinery and Tools,	20	No orders.	
243	Brass and Bronze Castings,	10	No orders.	
244	Typewriters,	280	Guard all elevator openings by keeping gates adjusted so as to work freely, and keep them closed when elevator is away from them.	Complied.
245	Edge Tools,	35	No orders.	
246	Newspapers,	39	No orders.	
247	Spoons and Forks,	200	Cover or sink flush projecting set-screws in collars on shafting.	Complied.
			Prohibit all persons under sixteen years of age from having care or operating elevator.	
248	Spoons and Hollow Ware,	85	Guard by railing belt running through floor in packing-room.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
			Provide better ventilation in pickling-room by connecting air shaft over pickling jars with exhaust system.	
249	Piano Stools,	75	No orders.	
250	Boring Implements and Edge Tools,	150	No orders.	
251	Cutlery,	275	Provide some suitable mechanical device whereby elevator car will be securely held in event of accident to shipper rope or hoisting machinery.	Complied.
252	Spoons, Knives, and, Locks,	70	No orders.	
253	Beer,	30	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
254	Printing Presses and Supplies,	9	No orders.	
255	Electric Power,	6	Thoroughly clean floor of oil around dynamos, and keep said floor as clean as the nature of the business will permit.	Complied.
256	Firearms,	125	Cover or sink flush all projecting set-screws in collars on shafting.	
			Thoroughly clean and repair water-closets; provide seats for the same, and keep said closets in good sanitary condition.	
257	Traveling Bags,	50	Cover or sink flush all projecting set screws in collars on shafting.	
258	Twine and Wicking,	50	No orders.	
259	Bronze and Brass,	15	No orders.	
260	Car Couplers,	7	No orders.	
261	Cutting and Threading Machinery,	18	No orders.	
262	Hardware,	75	No orders.	
263	Card Board,	12	No orders.	
264	Printing,	5	No orders.	
265	Monuments,	45	No orders.	
266	Rolled Steel,	100	No orders.	
267	Copper Refining,	135	No orders.	
268	Forgings,	85	No orders.	
269	Jobbing,	5	No orders.	
270	Corsets,	1500	Guard all elevator openings by putting gates in proper working order, and keep them closed when elevator cars are away from same.	Complied.
			Cover or sink flush all projecting set-screws in collars on shafting.	
			Guard by boxing belt to exhaust fan in coraline-room.	
271	Gun Implements,	125	Repair flooring in engine-room.	Complied.
272	Shirts,	380	No orders.	
273	Dress Stays,	250	Cover or sink flush all projecting set screws in collars on shafting in printing-room, first floor.	Complied.
274	Mattresses,	5	No orders.	

275	Corsets and Waists,	54	No orders. (Proper authority notified of insufficient means of egress.)	
276	Hoisting Grain,	7	No orders.	
277	Brass Goods,	26	No orders.	
278	Hardware Specialties,	23	No orders.	
279	Beer,	14	No orders.	
280	Plummers' Supplies,	54	No orders.	
281	Hoisting Grain,	50	No orders.	
282	Printing,	24	No orders.	
283	Patent Leather,	35	No orders.	
284	Printing,	23	No orders.	
285	Ladies' Cloaks,	110	No orders.	
286	Organs and Music,	144	No orders.	
287	Organs and Organets,	101	No orders.	
288	Nickel and Silver Novelties,	97	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
289	Machine Tools,	17	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
290	Wood Work,	20	No orders.	
291	Brass Specialties,	102	Provide better ventilation in dip-room by connecting with exhaust system.	Complied.
292	Clocks,	50	Introduce and operate, within three months from date of this order, such appliances or devices as may be necessary to remove the excessive dust generated in rouge buffing-room. Provide such ventilation in dip-room as will remove the excessive fumes of acid. Provide ventilating shaft in plating-room. Provide suitable seats to outside water-closets.	
293	Decorated Glass Ware,	60	No orders.	
294	Paper and Plush Boxes,	26	No orders.	
295	Decorated Glass Ware,	24	No orders.	
296	White Metal Specialties,	29	No orders.	
297	German Silver Flat Ware,	85	No orders. (Notified proper authority of insufficient means of egress).	
298	German Silver and Nickel Ware,	93	Securely guard by iron-railing small engine.	Complied.
299	Brass and Iron Furniture,	230	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
300	Silver Plated Ware,	25	Guard main belt on first floor by casing four feet in height.	Complied.
			Cover or sink flush projecting set-screws in collars on shafting on second floor.	
301	Solid Silver and Plated Ware,	514	Guard elevator openings by railing or bars to prevent employes crossing over automatic hatches.	Complied.
			Guard by secure railing stairway opening in iron trimming-room.	
			Guard by boxing main belt running through floor in raising-room.	
			Provide better ventilation in steel pickling-room, if said room will be continued in use as at present.	
302	Wheel Stock,	27	Provide separate water-closet for female employes in building.	
303	Wagon and Carriage Wheels,	22	No orders.	
304	Wood Work,	35	No orders.	
305	Brass Rules,	7	No orders.	
306	Laundring,	12	No orders.	
307	Metal Novelties,	42	Guard elevator openings by railing to prevent employes crossing over automatic hatches.	
			Provide better ventilation in plating-room.	
308	Macintoshes,	45	No orders. (Notified proper authority of insufficient means of egress.)	
309	Insulated Wire,	137	No orders.	
310	Silver and Plated Ware,	150	Provide better ventilation for wash-room.	
311	Plated and Silver Ware,	300	No orders.	
312	Paper Caps and Torpedoes,	20	No orders.	
314	Hollow Ware and Novelties,	26	No orders.	
315	Game Traps, etc.,	12	No orders.	

316	Sheet Brass and Tubing,	450	Provide better ventilation in dip-room.	
			Introduce and operate, within three months from the date of this order, such appliances or devices as may be necessary to remove the excessive dust generated in buffing-room.	
317	Machinery and Castings,	300	No orders.	
318	Brass and Copper Goods,	700	No orders.	
319	Brass Goods,	480	Guard elevator openings by rails to prevent employes crossing over automatic hatches.	Complied.
320	Electric Power,	15	No orders.	
321	Steam and Gas Pipe Cutting,	38	No orders.	
322	Mouldings,	4	No orders.	
323	Watches,	500	No orders.	
324	Rolled Brass, Copper, and German Silver,	940	Provide gate to elevator opening near outside door to butt-room.	Complied.
			Repair and keep in good working order all elevator gates, and keep them closed when elevator is away from same.	
			Cover or sink flush all projecting set-screws in collars on shafting in carpenter shop.	
325	Insulated Wire,	125	No orders. (Notified proper authority of insufficient means of egress.)	
326	Newspapers,	22	No orders.	
327	Woolens,	220	Cover or sink flush all projecting set-screws in collars on shafting.	Complied.
			Guard by boxing driving-belt to dynamo in engine-room.	
328	Iron Bolts and Nuts,	230	No orders.	
329	Electric Power,	5	No orders.	
330	Gas Stoves,	20	Put in proper working order safety-catches on elevator car.	
			Put gates at elevator openings in proper working order and keep them closed when elevator is away from same.	In Process.
			Provide secure hand railing to stairway.	
			Provide new cable for elevator.	
331	Crushed Stone,	20	No orders.	
332	Newspapers,	5	No orders.	
333	Woolen Goods,	80	No orders.	
334	Sheet Brass and Copper,	650	No orders.	
335	Machinery and Tools,	175	No orders.	
336	Brass Goods,	180	No orders.	
337	Furniture,	50	No orders.	

REPORT OF INSPECTIONS — CONTINUED.

Order No.	Goods Manufactured.	No. of Employes.	Orders Given.	Compliances.
338	Bicycles,	132	No orders.	
339	Newspapers,	11	No orders.	
340	Doors, Sash, and Blinds,	70	No orders.	
341	Novelties,	37	Cover or sink flush projecting set-screws in collars on shafting in packing-room.	Complied.
342	Cotton Cloth,	300	No orders.	
343	Plain and Fancy Cotton Goods,	1,500	No orders.	
344	Cotton Cloth,	140	Adjust gates to main elevator so as to work automatically, and keep them in proper working order so as to be closed when elevator is away from same. Thoroughly clean and disinfect water-closets and keep the same in good sanitary condition.	Partialy Complied.
345	Tanning,	56	No orders.	
346	Belts,	20	No orders.	
347	Paper,	32	No orders.	
348	Paper,	150	Guard by gate, bar, or chain, elevator opening on second floor and keep closed when elevator is away from same.	Complied.
349	Bleaching, Dyeing, and Printing,	500	No orders.	
350	Cotton Goods,	450	No orders.	
351	Car Repairing,	53	No orders.	
352	Electric Light,	9	No orders.	
353	Firearms,	45	No orders.	
354	Bicycle Chains,	40	No orders. (Proper authority notified of insufficient means of egress.)	
355	Machinery,	8	No orders.	
356	Firearms,	47	No orders.	
357	Wood Turning,	7	No orders.	
358	Heavy Cotton Yarn,	14	Guard by secure railing, three feet high, driving-rod and wheel to engine.	Complied.

359	Cotton Thread,	40	No orders.	
360	Flocks,	5	No orders.	
361	Cotton Thread,	11	No orders.	
362	Hats,	9	No orders.	
363	Cart Springs,	50	No orders.	
364	Weiss Beer,	5	No orders.	
365	Cornice and Skylights,	18	No orders.	
366	Printing,	14	No orders.	

LAWS

RELATING TO

FACTORIES AND FACTORY INSPECTORS.

(General Statutes.)

CHAPTER CXLV.

Section 2264. The inspector of factories shall, as often as practicable, carefully examine all buildings and places where machinery shall be used, and shall have authority to enter such buildings and places at all proper times for the purposes of such inspection.

Sec. 2265. All factories and buildings where machinery shall be used shall be well ventilated, and kept as clean as the nature of the business will permit. The belting, shafting, gearing, machinery, and drums of all factories and buildings where machinery shall be used, when so placed as, in the opinion of the inspector, to be dangerous to the persons employed therein while engaged in their ordinary duties, shall, as far as practicable, be securely guarded. No machinery other than steam engines in a factory shall be cleaned while running, after notice forbidding the same is given by the inspector to the owners or operators of the factory.

Sec. 2266. The inspector may order the opening of all hoistways, hatchways, elevator-wells, and wheel-holes, upon every floor of any factory or other building where machinery shall be used, to be protected by good trap-doors, self-closing hatches, and safety-catches, or other safeguards, such as will insure the safety of the employes in such factory or other buildings where machinery shall be used, and all due diligence shall be used to keep such trap-doors closed at all times, except when in actual use by an occupant of the building having the use and control of the same.

(Amended by Chap. CXVIII, Public Acts, 1893. See page 88.)

Sec. 2267. Every person or corporation managing or operating any factory, or owning or controlling the use of any other building where more than five persons shall be employed at labor, shall provide suitable water-closet accommodations for the use of the persons employed, and shall keep the same in good sanitary condition.

Sec. 2268. It shall be the duty of the inspector to enforce the provisions of this chapter by giving proper orders or notices to the persons or corporations owning, operating, or managing the factories or buildings inspected by him, and also to make complaint to the state's attorneys in the several counties respectively of all violations of this chapter.

Sec. 2269. Any person, firm, or corporation being the owner, lessee, or occupant of any factory or building included within the provisions of this chapter, or owning or controlling the use of any room in such building, shall, for the violation of any provisions of sections 2265, 2266, or 2267, forfeit to the use of the state not less than fifty nor more than five hundred dollars, and shall also be liable to any employe for all damages suffered by him by reason of such violation. It shall be the duty of the state's attorneys in the several counties to collect forfeitures under this chapter, but no suit shall be brought for any such violation, either in behalf of any person or the State, until four weeks after notice has been given by the inspector to such person, firm, or corporation of any changes necessary to be made to comply with the provisions of said sections, and not then, if, in the meantime, such changes have been made in accordance with such notification. Nothing herein shall be construed as limiting in any way the right of a person injured to bring an action to recover damages for the same, as though this chapter had not been enacted.

(Amended by Chapter CCXXV, Public Acts, 1889. See page 86.)

Sec. 2270. The orders and notices given by the inspector under this chapter shall be written or printed, and signed by him officially, and may be served by himself or any proper officer or indifferent person, by leaving an attested copy thereof with or at the usual place of abode of the person upon whom service is to be made; and the notice, properly endorsed with the doings of the person or officer serving the same, shall be returned to the office of the town clerk of the town in which is located the factory, building, or business to which such notice appertains, where it shall be kept on file. Such notice, and copies thereof, duly certified by the town clerk, shall be "prima facie" evidence that notice was given as therein appears. Notice to one member of a firm shall be notice to every member thereof, and notice to the president, secretary, or treasurer of a corporation shall be notice to such corporation. The fees for serving such orders and notices, unless served by the inspector, shall be the same as for the service of process in civil actions, and shall be included in the necessary expenses of the inspector and paid by the state.

Sec. 2271. It shall be the duty of the comptroller to provide suitable rooms in the capitol at Hartford for the use of the inspector, and to furnish him blank forms for the purpose of giving notices and orders required by this chapter, and for annual reports to be made to the governor. The inspector shall keep, in books provided by the comptroller for that purpose, copies of all notice and orders given by him, and a record of all inspections and examinations made, and upon the expiration of his term of office shall file his books of record with the secretary of the state.

Sec. 2272. The inspector may from time to time employ special agents to assist him in his inspections and examinations, who shall receive compensation for the time actually employed in such service only. The total amount expended under this section shall not exceed in any one year the sum of fifteen hundred dollars, which shall be paid by the state upon proper vouchers by the special agents, which shall be signed by the inspector.

(Amended by Chapter CCVI, Public Acts, 1893. See page 89.)

(Public Acts of 1889.)

CHAPTER CLXXIII.

An Act concerning Printing of Reports of the Inspector of Factories.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. The comptroller shall annually cause to be printed, at the expense of the state, five thousand copies of the report of the inspector of factories.

Sec. 2. This act shall take effect upon its passage.

Approved, June 4, 1889.

(Public Acts of 1889.)

CHAPTER CCXXV.

An Act relating to Factories.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 2269 of the general statutes is hereby amended by inserting between the words " sections " and the figures " 2265 " in the fifth line thereof, the figures " 2264," so that the first sentence of said section as amended shall read as follows: Any person, firm, or corporation being the owner, or lessee, or occupant of any factory or building included within the provisions of this chapter, or owning or controlling the use of any room in such building, shall, for a violation of any provisions of sections 2264, 2265, 2266, 2267, forfeit to the use of the state not less than fifty nor more than five hundred dollars, and shall also be liable to any employe for all damages suffered by him by reason of such violation.

Approved, June 19, 1889.

(Amended by Chapter 206. See page 90.)

(Public Acts of 1893.)

CHAPTER LIX.

An Act concerning the Employment of Custodians of Elevators.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. No person, partnership, or corporation shall permit or employ any person under the age of sixteen years to have the care, custody, operation, or management of any elevator.

Sec. 2. Any person, partnership, or corporation violating the provisions of this act shall be punished by a fine of not less than five dollars nor more than twenty-five dollars for each offense.

Approved, April 19, 1893.

(Public Acts of 1893.)

CHAPTER LXXVII.

An Act concerning Seats for Female Operatives.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. Every person, partnership, or corporation employing females, in any mercantile, mechanical, or manufacturing establishment in this state, shall furnish and provide suitable seats for the use of all females so employed, and shall permit the use of such seats by said females when they are not necessarily engaged in the active duties for which they are employed.

Sec. 2. Any person, partnership, or corporation violating any of the provisions of this act shall be punished by a fine of not less than five dollars nor more than fifty dollars for each and every offense.

Approved, April 19, 1893.

(Public Acts of 1893.)

CHAPTER CXVIII.

An Act concerning Elevators.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 2266 of the general statutes is hereby amended to read as follows: The inspector of factories may order the opening of all hoistways, hatchways, elevator wells, and well holes, upon every floor of every factory, mercantile establishment or other building where machinery shall be used, to be protected by good trap-doors, self-closing hatches, and safety catches or other safeguards, such as will ensure the safety of the employes in such factory, mercantile establishment, or other building where machinery shall be used, and all due diligence shall be used to keep such trap-doors closed at all times, except when in actual use by an occupant of the building having the use and control of the same. All elevator cabs or cars, whether used for freight or passengers, shall be provided with some suitable mechanical device, if considered necessary by the said inspector, whereby the cab or car will be securely held in the event of accident to the shipper-rope or hoisting machinery, or from any similar cause, and said mechanical device shall at all times be kept in good working order.

Approved, May 18, 1893.

(Public Acts of 1893.)

CHAPTER CCIV.

An Act for the Preservation of the Health of Factory Employees.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Sec. 1. Whenever the inspector of factories, on the complaint of any person, after due investigation, shall find it necessary for the preservation of the health of the employes in any manufacturing establishment, factory, or mill in which is carried on the business of buffing, polishing, or grinding metal, or any operations in which an excessive amount of dust is generated, that the excessive dust resulting from said operations should be removed from the atmosphere of the rooms or apartments used for that purpose, he shall, in writing, direct the person or persons or corporation owning or occupying said premises, or carrying on business in such premises, within three months from the date of said order, to introduce and operate such appliances or devices as may be necessary to remove, so far as the nature of the business will permit, such excessive dust or foreign matter from the atmosphere of such mill, factory, or apartment used for the purposes aforesaid; provided, such appliances or devices do not restrict or interfere with the aforesaid business or operations.

Sec. 2. Any violation of any proper order made or given by the inspector of factories, under the provision of the preceding section, shall be punished in the manner provided in section 2269 of the general statutes.

Approved, June 14, 1893.

(Public Acts of 1893.)

CHAPTER CCVI.

An Act relating to Duties of the Inspector of Factories.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 2272 of the general statutes is hereby amended to read as follows: The inspector may from time to time employ special agents to assist him in the performance of the duties of his office. Such special agents while so employed shall have the same power and authority as the inspector, subject to his approval. The total amount expended under this section shall not exceed in any one year the sum of three thousand dollars, which shall be paid in the same manner as the expenses of other departments of the state government, upon proper vouchers by the special agents, signed by the inspector.

Approved, June 14, 1893.

(Substitute for House Bill No. 263.)

Public Acts of 1895.

CHAPTER CCVI.

An Act concerning Inspection of Factories.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. Section 2269 of the general statutes is hereby amended to read as follows: Any person, firm, or corporation, being the owner, lessee, or occupant of any factory or building included within the provisions of this chapter, or owning or controlling the use of any room in such building, shall, for any violation of sections 2265, 2266, or 2267 of the general statutes, or for obstructing or hindering the inspector of factories in carrying out the duties of his office, forfeit to the use of the state not more than fifty dollars. It shall be the duty of the state's attorneys in the several counties to collect forfeitures under this chapter, but no suit shall be brought for any such violation until four weeks after notice has been given by the inspector to such person, firm, or corporation of any changes necessary to be made to comply with the provisions of said sections, and not then if, in the meantime, such changes have been made in accordance with such notification. Nothing herein shall be construed as limiting in any way the right of a person injured to bring an action to recover damages for the same, as though this chapter had not been enacted.

Sec. 2. Any person, firm, or corporation aggrieved by any order of an inspector of factories may appeal to the superior court in the county where the person, firm, or corporation owns, leases, or occupies the factory or building in relation to which said order relates, within four weeks after notice of such order shall be given. Said appeal shall operate as a supersedeas, shall be made in writing, and shall contain a brief statement of the facts and reasons of appeal and a citation to the inspector of factories to appear before said court, and said court or any judge thereof may direct the time of appearance and the manner of service. Said court may review the doings of the factory inspector, may examine the questions in issue, and may confirm, change, or set aside the doings of the factory inspector, and may make such orders in the premises, including orders as to costs, as it may find to be proper and equitable.

Sec. 3. All acts and parts of acts inconsistent herewith are hereby repealed.

Approved, July 9, 1895.

(House Bill No. 669.)

CHAPTER CCXCIV.

An Act concerning Department Reports.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. All reports heretofore or hereafter required to be made by state departments, institutions, commissions, boards, or any recipients of state money shall, from and after the passage of this act, be made to the governor and by him transmitted to the general assembly.

Sec. 2. All reports above referred to shall be made to and including the thirtieth of September, 1895, and annually thereafter, and shall be published on or before the thirty-first day of December following; provided, however, that the reports of the insurance commissioner and the state board of education may be made at times and for the periods now required by law, and the reports of the state board of agriculture and of the agricultural experiment stations may be made as heretofore.

Sec. 3. All acts and parts of acts inconsistent herewith are hereby repealed.

Sec. 4. This act shall take effect from its passage.

Approved, July 4, 1895.

REPORT

OF

THE DIRECTORS

OF THE

CONNECTICUT STATE PRISON

TO

THE GOVERNOR,

For the fiscal year ending
September 30, 1895.

Printed by Order of the General Assembly.

PORTLAND, CONN.:
PRESS OF EDWARD F. BIGELOW.
1895.

ROSTER OF OFFICERS

OF THE

CONNECTICUT STATE PRISON.

DIRECTORS,

JAMES W. CHENEY, *President*,	South Manchester.
THOMAS DUDLEY WELLS, *Secretary*,	Waterbury.
FRANK C. SUMNER,	Hartford.
MARVIN H. SANFORD,	Simsbury.
CHARLES F. BOLLMANN,	New Haven.
JOHN W. MARVIN,	Deep River.
JAMES McLAUGHLIN, Deceased,	Stafford Springs.

WARDEN,

JABEZ L. WOODBRIDGE, Hartford.

DEPUTY WARDEN,

GEORGE E. BAISDEN, Rocky Hill.

CLERK,

H. KIRK WOODBRIDGE, Hartford.

CHAPLAIN,

DIGHTON MOSES, Granby.

PHYSICIAN,

EDWARD G. FOX, Wethersfield.

STEWARD,

LUCIEN M. HORTON, Hartford.

HALL-KEEPER,

T. CHARLES TREDEAU, Hartford.

GATE-KEEPER,

HENRY G. RISLEY, Windsor.

DAY GUARD ROOM OFFICER,

DAVID R. BOGUE, Columbia.

OVERSEERS OF CONTRACT SHOPS,

Henry Holmes, Wethersfield.
John S. Doolittle, Hartford.
James E. Officer, Hartford.
William E. Officer, Hartford.
Albert Perkins, Westville.
George T. Smith, Hartford.

OVERSEER OF MEN'S LAUNDRY AND STATE SHOP,

Daniel F. Murphy, Rockville.

CHIEF ENGINEER,

Eli W. Giddings, Canaan.

NIGHT ENGINEER,

James E. Sherman, Manchester.

FARMER,

Robert L. Fulton, Wethersfield.

ELECTRICIAN,

John F. Reilly, Hartford.

FRONT GUARD OFFICER,

William D. DeBlois.

HALL WATCHMEN,

Elbert A. Fuller, Andover,
Chas. E. Upton, Hartford.
James H. Clarkin, Hartford.
Albert Adams, Wethersfield,
Charles L. Whitmore, Hartford.
John F. Lehr, Hartford.
Alvin S. Hull, New Haven.
James H. Buckley, Rocky Hill.
Marcus G. Whitham, Middletown.
Frederick J. Coudray, Wethersfield.

WALL WATCHMEN,

William H. Mildrum, Wethersfield.
James E. Thomson, Hartford.
John Minor, Westville.

NIGHT GUARD ROOM OFFICER,

Patrick J. Ahern, South Manchester.

NIGHT WATCHMEN,

Thos. L. Chatfield, Wethersfield.
Ralph F. Hills, Wethersfield,
Emerson D. Babcock, Wethersfield.

MATRON,

Ella H. Whitmore, Hartford.

State of Connecticut.

REPORT OF THE DIRECTORS.

To His Excellency, O. VINCENT COFFIN, Governor.

SIR:—

The directors of the Connecticut State prison beg herewith to submit their annual report for the fiscal year ending September 30, 1895. The reports of the warden, the prison physician, and the Protestant and Catholic chaplains, which describe in detail the prison life, work, management and progress during the twelvemonth, are appended.

Vacancies in the directorate caused by the expiration of the terms of three members and by the death of Mr. John N. Chittenden, of Madison, who passed away March 2, after having efficiently served the interests of the prison for nearly two years, were filled on July 1 by the appointment of four new members, comprising a majority of the board. On August 2, Mr. James McLaughlin, who after only a single month's service as a member of the board had abundantly demonstrated his superior qualifications for prison management, suddenly died at his home in Stafford Springs.

Twenty meetings have been held by the board during the year. Moreover, the directors have made frequent visits to the prison individually and by committee, and probably not a week in the course of which the institution has not been inspected by one or more members of the board has elapsed during the period covered by this report. Meetings are now regularly held on the second Tuesday of each month and special meetings are called whenever occasion may demand. Two standing committees—an executive committee and an auditing committee—have been created.

During the year under review much of the attention of the board has been devoted to improving the physical condition and sanitary arrangements of the prison. A new system of heating and ventilating, which, it is confidently believed, is based on modern scientific principles, has been introduced into the main cell block, and it is not improbable that the improved general health of the convicts may in a considerable degree be traced to this change. The men's laundry has been equipped with a steam sterilizing apparatus which is extensively used and which is fatal to germ life. The grounds in front of the institution, which formerly sloped gradually from the highway to the prison, have been levelled and graded, thus preventing storm water from settling under the buildings. The interior grounds have also been partially graded, and dilapidated walks have been relaid. One of the workshops has been equipped with an outside elevator, and an interior elevator has been erected in the state shop, so called, at the east of the cell block. Three large wire cages in which incorrigible convicts may secure needed outdoor exercise in suitable weather, have been erected in the prison yard. By the construction and furnishing of five comfortable and convenient rooms in an unused attic fewer officers will hereafter be compelled, by inadequate dormitory accommodations at the prison, to reside outside the institution. Hose-houses have been built over the fire hydrants. All parts of the main prison wall have been provided with a double guard-rail for the better protection of the wall watchmen. The old storehouse, which was in a condition of decay and which had become entirely insufficient for the needs of the institution, has been torn down and a commodious new structure is approaching completion. A new and enlarged kitchen, rendered necessary by the growth of the prison, is now being constructed and will probably be ready for occupancy in December.

Apart from the storehouse and the kitchen much of the work on the various permanent improvements has been performed by convict labor, although the cost of the raw material has inevitably been considerable. The expenditures which have been made for the physical improvement and better equipment of the institution have been large, but the board venture to think that no cent has been spent in a manner which could reasonably be called extravagant or which was not warranted by the dictates of sound business.

The legislative appropriation of $20,000 for the erection of additional cells in the old west wing will temporarily relieve the over-crowded condition of the prison. The contract for the construction of thirty-two independent steel cells in the west wing, together with six well heated and ventilated dungeon cells under the present kitchen, has already been awarded.

The vexatious problem of finding proper employment for the prisoners not working under contract has been solved by the introduction of the shirt industry. By negotiations completed with the New York Shirt Company, July 16, the state is to receive a certain price for each dozen of shirts manufactured for the company by convict labor. The company furnish the raw materials and do the cutting. Shop No. 4, so called, has been equipped with machinery by the company, and at present all the available prisoners who are not otherwise employed are working in the shirt shop. The new industry will materially increase the earnings from prison labor, and the compulsory idleness of able-bodied convicts, which the board believe to be altogether detrimental to the welfare of the men, is obviated. The piece-price plan which has been adopted in the shirt industry and under which the earnings of the prisoners depend directly upon the quantity of work done is essentially different from the contract system which obtains in the shoe industry and under which the state receives an arbitrary daily sum for the labor of each man. Each system has comparative advantages and comparative disadvantages.

The water-supply question, which for years has been a source of anxiety to the prison administration, has not yet been settled. The quality of the water is particularly unsatisfactory in warm weather, and the old cement pipes through which the water is conveyed to the institution are constantly liable to break, thus exposing the prison to serious temporary inconvenience. No plan by which a new, better and adequate supply can be obtained without heavy expenditure has yet been devised, and the project which was under favorable consideration at the time of the board's last annual report did not, upon further investigation, prove to be entirely satisfactory and it has been abandoned for the time.

The general health of the convicts has not only been good, but has shown visible improvement. This, the board suppose, is attributable in part to the changes in sanitation and in part to the enlarged and more varied prison diet, while the hygienic results of the outdoor exercise drills have continued to be beneficial. The death rate per 1,000 of average population during the year was 29.77, as against 43.95 for the previous year. The low and marshy nature of the grounds on which the institution is located interposes obstacles to the attainment of the highest sanitary results.

The spirit which has prevailed among the convicts has, in the main, been good, and the percentage of men who have been punished for infractions of the prison rules has been gratifyingly small. The discipline of the prison aims to be firm without being severe, and kind without being weak, and in the administration of punishments an effort is constantly made to adjust the penalty to the conditions and requirements of each individual case. The loyalty, willingness, industry and courtesy which have been displayed by the officers during the year have been important aids in establishing the standard of prison management.

The departmental reports and statistical tables which are subjoined contain detailed information concerning the fiscal year at the prison.

Respectfully submitted,

JAMES W. CHENEY,
THOMAS DUDLEY WELLS,
FRANK C. SUMNER,
MARVIN H. SANFORD,
CHARLES F. BOLLMANN,
JOHN W. MARVIN.
Directors of State Prison.

WETHERSFIELD, Conn., Sept. 30, 1895.

WARDEN'S REPORT.

To the Honorable Board of Directors of the Connecticut State Prison,
JAMES W. CHENEY, President.

GENTLEMEN:—

In accordance with Section 3,343, Chapter CCVII, of the General Statutes, State of Connecticut, I have the honor to herewith hand you my second annual report as warden of the Connecticut State prison, covering both financial and statistical tables for the fiscal year ending Sept. 30, 1895.

On Oct. 1, 1894, there were confined in this institution 381 convicts, consisting of 331 white males, 7 white females, 42 colored males, and 1 colored female. 186 prisoners have been received and 172 have been discharged during the year, making the total number confined 567, and leaving in confinement, Sept. 30, 1895, 395, divided as follows: 363 white males, 5 white females, 26 colored males, and 1 colored female, being 14 more than on the same date of the preceding year.

The largest number in confinement was on the 4th day of May —420, and the smallest number on the 1st day of Feby.—369. The average for the year has been 403, and for the preceding year 351$\frac{1}{12}$, showing an average gain of over 50 for the year.

The general health of the inmates has shown a marked improvement over last year. The daily sick list has decreased and the death rate has been greatly reduced, although the population of the institution for the year has been largely increased. I would respectfully refer you to the physician's report for full details. The continued and persistent efforts towards improvement in heating and ventilation, the destruction of disease germs by disinfectants and the sterilizing by steam of all clothing, the greater variety, better quality and larger quantity of food allowed, together with the compulsory outdoor exercise of the men, begin to show their beneficial effects. With the improvement in general health there is shown also a marked improvement in the disposition of the inmates as a whole.

Tables will be found following, giving a complete statement of the financial condition of the institution in which a full accounting of all moneys received and disbursed for the fiscal year is shown, together with statistical tables giving a complete roster of the inmates on Sept. 30, 1895, and commitments, discharges, deaths and other tables and items of interest and importance.

The various books of record and the daily and monthly reports of the officers in charge of their different departments, the vouchers from the heads of each department for all articles received or passed out of the prison—methods instituted the preceding year—have been continued, and, whenever possible, additional records, reports and safeguards have been adopted for a more thorough knowledge of all transactions connected with the institution and for an honest and economical administration of its affairs.

DISBURSEMENTS.

By reference to the financial table marked number 1, or profit and loss account, there will be shown the actual amounts expended and charged to the various classified accounts for the detention and maintenance of the convicts confined within the institution, and the proper care of all State property, all of which has been done by your written orders and under the personal supervision of a committee appointed by your honorable board. The larger and more important disbursements were for the following items:

PERMANENT IMPROVEMENTS.

This amount, seven thousand, two hundred and thirteen dollars and sixty-six cents ($7,213.66), covers all outlays of moneys for buildings and material of a permanent nature and required by the increased number of inmates and the exigencies of the conditions as found. Of the more important of these improvements those for the better health and sanitary condition of the institution, I would especially mention the new heating and ventilating system introduced into the main block, or cell hall, where all the male convicts are confined nights, unless in the hospital, the grading of the grounds in front of the institution, and the introduction of machinery for the sterilizing by live steam of all clothing used on or about the convict and in the cells.

HEATING AND VENTILATING.

In the original construction of the new block, so called, occucupied Aug., 1888, a sealed air space about 10 feet high above the upper tier of cells and under the roof was constructed, into which were run vent pipes from the 390 water-closets situated in the cells and from the main sewer. Alongside of these vent pipes came 390 independent ventilating flues, one from each cell, all reaching about 1½ feet into the closed space. Three air flues on each side of the block were constructed, running down from this air space through the pilasters or re-enforcements for the outer walls of the building, and back through registers to the floors of the corriders in front of the cells. Six 20-inch ventilators had been placed at equal distance apart through the roof to carry off the foul air arising from the sewer pipe, and such foul air as would arise from the cells through the air flues. What foul air could not escape through these six 20-inch ventilators into the open air, from its own weight, dropped back through the independent air flues into each cell and back through the flues in the outer walls to the floor. No arrangement for the introduction of fresh air into the block had been made except through the doors and windows, when the weather would permit of their being open. Along the walls of the building was a system of steam pipes for heating purposes, thus heating in the winter time the sewer gas from the closets that had dropped back through the independent air flues to the cells and through the flues in the outer walls back into the corridors. By your direction and under the supervision of your committee, the system has been entirely changed. The vents from the closets have been grouped and run through the roof, no foul air from sewer or closet escaping into the sealed air space. The flues running through the pilaster have been sealed at their opening in sealed space, and large registers placed in flues 10 feet from the ground on outside of building, the flues again being sealed above the outer register, allowing fresh air to pass through register down and through the inner register to the corridor of the block. In the basement or cellar under the block have been run steam pipes connecting with large heating-surfaces over which fresh air taken from outside through flues is passed over these heating surfaces, and up through registers in the floor of the block to the corridors. In place of the six ventilators through the roof, six 21-inch revolving or suction ventilators have been placed, insuring at all times a gentle draft of either warm or cool fresh air through the independent ventilating flues in each cell to the sealed air space, and out through the suction ventilators on the roof. The difference in the atmosphere in the cells and corridors of the block can better be imagined than described.

GRADING.

The grading of the grounds in front of the institution was equally necessitated by their condition. It was found that the ground surface was twenty-nine inches lower at the entrance to the prison than at the gate, 111 yards away, and all water from the street in front and from the grounds ran to and under the buildings, excepting such as collected in low places, which when frozen over made an excellent skating pond and was much utilized by the officers when not on duty and by the boys about the village. It has now been raised and graded so that all water runs from the buildings, causing the walls and cellars to be dry and healthy. Aside from the beautifying effect to this State institution, the sanitary effect upon the inmates can not be over-estimated.

STERILIZING APPARATUS.

A very effectual washing and sterilizing machine combined, with machinery for same, has been placed in the men's laundry, through which all prisoners' clothes, bedding, carpets, etc., are passed, being subjected, while in the machine, to a pressure of from twenty to thirty pounds of live steam, thus thoroughly sterilizing all articles and assuring the destruction of all life and disease germs. The process has met our full expectations and in time bids fair to stamp out to a great extent that most destructive and persistent disease, consumption. The ventilating, heating and sterilizing process have met the hearty approval of the State Board of Health.

GENERAL.

Grading within the walls and the laying of stone and concrete walks and cellar bottoms; the erection of iron stairways for the passage of the directors and visitors and others to the warden's house, and for servants to pass to and from their sleeping apartments without passing through rooms and hall of warden's house; the erection of elevators outside and inside of work shops; exercise cages in prison yard for the safe detention of incorrigible prisoners while exercising in open air; [the erection of hose-houses over hydrants for the better protection against fire; double guard-rail on wall for the better protection of wall watchmen, and for other additions of necessity and material importance to the institution account for the expenditures charged to permanent improvements. This work, with the exception of the steam heating, was done by convict labor, thus materially reducing the cost.

IMPROVEMENTS AND REPAIRS.

The amount expended, three thousand five hundred and seventy-one dollars and thirty-nine cents ($3,571.39) (see table No. 1), and charged to this account, covers the outlay for material used in making changes in the interior and replacing and making good the wear and tear of roofs, floors, and gutter-pipes, and other parts of the State buildings. The buildings not having been painted for a number of years (with the exception of those erected the previous year), have been thoroughly renovated both inside and out, walls repainted where needed; in fact all parts of this institution have been put in a thorough state of repair. The amount expended was nearly one thousand dollars less than the estimate, as the work was entirely done by convicts not otherwise employed, only material being purchased.

SALARIES.

For the year there has been expended for the proper care, discipline, and detention of the prisoners, and care of the State property, the sum of twenty-five thousand and sixty-nine dollars and ten cents ($25,069.10). (See table No. 1). Owing to the increased number of inmates additional officers have been required for their proper management. Upon my recommendation your honorable board advanced the wages of all overseers and night and hall watchmen on an average of five dollars per month, which action has been duly appreciated by them.

Good pay adds greatly to the warden's ability to procure and retain good men for officers. The successful management of a penal institution depends almost wholly upon the warden's officers. They should be men of intelligence, of firmness with kindness, courage and ability. Without this class of men the warden is powerless. Good fortune has entered largely in procuring so efficient a corps of officers as are now charged with the safe keeping and care of the convicts confined here. By reference to table number 6 it will be seen that the average number of prisoners confined for the year has been 403, with a daily cost of $17\frac{29}{100}$ cents per capita.

PRISON PROVISION.

A continued effort has been made to add to the quantity, quality and variety of food furnished to the prisoners as far as has been consistent with a proper regard to the cost. The ration table gives a daily list of the food furnished. The practice of inspection of all food before being accepted, by a committee appointed by the warden for that purpose, and also the weekly inspection of food on different days by the prison physician, has been continued. The food furnished by those under contract and also that purchased in the open market by the warden, has been exceptionally good. The garden and farm cultivated by the prisoners have furnished in great variety and quantity at a small cost, vegetables in their season that have been very beneficial and greatly enjoyed by the inmates. During their season also alewives have been supplied, caught in nets by the prisoners in the adjacent cove, much to their satisfaction, making a beneficial change of diet without cost.

The practice of visiting the prisoners in their cells on Sundays has been continued, with the exception of rare intervals, and during the year hardly a complaint has been made on account of rations,—all of which has tended to keep the men in better health and in a more contented state of mind. Table No. 6 shows that the cost of food furnished has been at the rate of $7\frac{48}{100}$ cents per capita per day for the 403 (average) prisoners confined. At the low rate per day it would seem advisable to add somewhat to their meat rations during the coming year.

LIGHT, FUEL, AND WATER.

The institution is still supplied with naphtha gas manufactured on the premises. In case of an accident to the gas machine, the lighting of the institution would depend entirely upon such illumination as could be obtained from inadequate kerosene lamps. This is entirely improper and unsafe, as will readily be perceived by giving the matter a thought. Electricity for lighting purposes should be introduced, which after its introduction is much cheaper and more satisfactory than naphtha gas. The latter could be utilized temporarily in case of an accident to the electric lighting. The running of wires and fitting of lamps could be done inside of the walls of the prison by the prisoners under the supervision of our electrician, simply for the cost of the material. Better safeguards would be thrown around the prisoners, the institution would be better lighted, there would be less danger to property, and I believe it would be more economical to the State.

The fuel for the year was purchased when coal was at its lowest point. From this amount, seven thousand and seventy dollars and seventy-five cents ($7,070.75), should be deducted the moneys received for motive power furnished to the contractors from this coal, which would reduce the cost of light, fuel and water by fourteen hundred and ten dollars and thirty-seven cents ($1,410.37) (shown as received for motive power on credit side of table No. 6), leaving the actual expenditure for these items, five thousand six hundred sixty dollars and thirty-eight cents ($5,660.38).

The question of the water supply for the institution is one that should have your serious consideration. It is now supplied by the Hartford Water Works at so much per hundred gallons as registered by a water meter. The institution being located at the extreme end of the main and miles away from the supply, during six months of the year at least the water furnished is almost unfit for drinking purposes, as fish of various kinds, ranging in weight from four ounces to four pounds, and in all stages of decomposition, are found jammed into the mains and meter, at times stopping the supply. But that is not the worst feature of the case. The main bringing the water from somewhere within the city limits to the walls of the prison, was laid some twenty-six years ago with the old fashioned cement pipe, from moneys appropriated for that purpose by the legislature to the Hartford Water Works. In May, 1894, the warden was notified by the president of the Board of Water Works that their Board had determined that the entire expense of maintaining these pipes should be undertaken by the parties benefited by it, and not by the Water Board. This matter was brought to the attention of your honorable board and the matter of a water supply from another source investigated by a special committee. But up to this time no definite action has been taken, and as time passes, although nothing serious has happened during the interval, every month's delay brings us nearer to the time when without doubt we shall be obliged to face the question in all its serious aspects. Some action should be taken to insure a permanent supply, with proper regard to the health and needs of the institution. Should a break occur, from these old pipes, it would be almost impossible to procure suitable drinking and cooking water to supply the inmates, and utterly impossible to supply water for the boilers in use for motive power and heating purposes. The actual daily cost for these items has been $3\frac{89}{100}$ cents per capita (see table No. 6), or a total cost of seven thousand and seventy dollars and seventy five cents ($7,070.75) for the year.

CLOTHING AND BEDDING.

This heading covers all articles necessary for the proper covering, night and day, of all prisoners confined, complete new suits, underwear and other articles of wearing apparel issued to those discharged, and the furnishing of all articles of bedding for the cells. In order to have a sufficient number of blankets, that they might be submitted to a washing and the sterilizing process as often as once a quarter, as advised by the State Board of Health, and to replace those unfit for use from long service, a large number of blankets, sufficient for a full change, have had to be purchased, together with many other articles in this connection. The actual cost per capita has been at the rate of $2\frac{18}{100}$ cents, or a total cost of three thousand one hundred and sixty-four dollars and ninety cents ($3,164.90). (See table No. 6).

OFFICERS' QUARTERS.

Owing to the increased number of officers required additional quarters were necessary and from plans drawn by a prisoner, from my suggestions, five additional rooms have been planned for on the story above the present dormitory, but not yet completed. These rooms are of sufficient size, lighted from the outside and well ventilated. All the wood work, plastering, steam and gas fitting will be done by convict labor, and so far in their erection two hundred and eighty-four dollars and sixteen cents ($248.16) has been expended. When completed this improvement will meet the requirements in this line for some years.

CHAPEL.

The amount shown as expended, six hundred and eleven dollars and eighty-nine cents ($611.89) (see table No. 1), covers all outlays for expense incurred for Sunday School teachers, organist, books, etc., necessary for the proper conduct of Sunday services, Sunday Schools, supplying the pulpit with services on Catholic Sundays, so called, and other minor matters, including the purchase by your president of a piano, the old organ in use having become useless from long service and being beyond repair. Rev. Dighton Moses has had charge of the Protestant, and Rev. Father J. T. Lynch, of St. Peter's Parish of Hartford, of the Roman Catholic services, and I would respectfully refer you to their reports found following for further information. Rev. Father Lynch has acted as the Roman Catholic chaplain at this institution for eight years, conducting services in the chapel once a month besides coming to the prison at any time when his services have been required by any of the inmates. As an evidence of the good feeling existing between the Protestant and Roman Catholic faiths I desire to state that Sunday schools of both denominations are being conducted in the chapel every Sunday at the same hour.

FARM ACCOUNT.

This account shows by the profit and loss sheet (see table No. 1) a loss of nine hundred seventy-nine dollars and twenty-eight cents ($979.28), which is the actual difference between expenditure for the year and the appraisal of farm stock, but as the amount of field produce was credited to prison provision, as it was to be consumed by prisoners, therefore this amount as a loss will be erroneous. The sum, nine hundred and seventy-nine dollars and twenty-eight cents ($979.28), is the expenditure and difference in appraisal of farm stock between this and last year. The appraisal of farm stock on hand September 30, 1895, amounted to five hundred and seventy-seven dollars and seventy cents ($577.70 cents), to which add field produce, as appraised at one thousand four hundred and sixty-one dollars and three cents ($1,461.03), and credited to prison provision, leaving the amount of one thousand nine hundred and seventy-eight dollars and seventy-three cents ($1,978.73); from this take the amount shown as expended, nine hundred and seventy-nine dollars and twenty-eight cents, ($979.28) showing a balance in favor of the farm account of nine hundred and ninety-nine dollars and forty-five cents ($999.45), which is the profit to the institution for the industry. This again clearly demonstrates the desirability of this institution furnishing as far as possible all articles of food consumption for its inmates. When it is taken into consideration that to make this showing land had to be rented, and fertilizers purchased (as at the planting season the arrangement for the making sufficient fertilizers to meet the requirement had not been completed), it will be clearly seen that this industry is not only profitable to the institution but of great benefit to its inmates, as it gives the warden an opportunity to find employment for the tramp element committed here,—which contractors will not take on their contracts owing to the usual short term of service,—and also opens a place where prisoners broken in health, whose terms have nearly expired, can be utilized to their physical benefit, as well as to make them self-sustaining.

EXPENSE ACCOUNT.

This account covers all supplies, books, vouchers, postage stamps and all expense of the office; the feed account for over 150 head of live stock, and pay of hired help etc. (See table No. 1.)

TRANSPORTATION OF CONVICTS, AND ADVERTISING.

These accounts show the amounts expended for the transportation of convicts to and from the Connecticut Hospital for the Insane at Middletown, and for all advertising done by the institution for bids for contracts, for provisions, for buildings, prisoners' applications before the Board of Pardons, etc. (See table No. 1,) the totals being forty-one dollars and twenty-five cents ($41.25), and one hundred and fifty-one dollars and forty-one cents ($151.41), respectively. (See table No. 1).

TOBACCO.

This account covers the actual expenditure for tobacco consumed by the prisoners for the year, amounting to four hundred and seventy-seven dollars and forty cents ($477.40) (See table No. 1), or at the rate of $\frac{33}{100}$ cents per capita per day. (See table No. 6).

EXECUTION HOUSE AND INSURANCE.

The amounts charged to these accounts are for the interior furnishing of the Execution House and for premium paid for fire insurance policies covering all buildings outside the prison wall and located in the back yard, so called, and all live stock, harnesses, carriages and hay and grain, and all prison supplies stored in the buildings, amounting respectively to forty-eight dollars and seventy-three cents ($48.73) and one hundred and ninety-six dollars and forty-two cents. (See table No. 1).

AMUSEMENTS AND NIGHT SCHOOLS.

Again I desire to express my thanks to those kindly disposed people who have given their time and expenses for the alleviation of the monotony of the prisoners confined here. The moments when the minds of these unfortunate creatures are off their own troubles are few indeed as the hours draw heavily along to the time of their discharge.

As expressed in a letter of a prisoner to a friend outside, "Yesterday is the same as to-morrow and to-day the same as last week." But if there is such a monotony to the prisoner looking forward to the day of his release, what must it be to the one condemned to spend his lifetime here with no bright hopes to encourage him. These "oases" in the desert of monotony are "heaven's best gift" to them, and are looked forward to as a panacea for almost all their sorrowings, and if the sincere and heartfelt thanks extended by the prisoners to those ladies and gentlemen are any remuneration for their time and money given, then they are well paid. There has been commencing with Nov. 1, 1894, an average of two entertainments a month up to April 1, 1895, at the small expense to the institution of five dollars and fifty cents ($5.50) (See table No. 1). Next to the entertainments the Night Schools are a great relief to those allowed to attend, and a great help to the institution, besides being of much permanent benefit to the prisoners. Two nights each week, twenty prisoners, as many as can be accommodated, are taken to the school room and taught to read and write and when sufficiently advanced they utilize the books in the prison library and read and write their own letters, thus relieving the officers of that duty. As there is sufficient room for six or eight additional desks I would respectfully recommend that your honorable board order this purchase. The chaplain acts as instructor. The sum of seventy-three dollars and twenty-five cents ($73.25) (See table No. 1) has been expended for books, writing material, etc., and supervision of the men while in school.

TINNERS' TOOLS AND SUPPLIES.

This account shows an expenditure over inventory of one hundred and fifty dollars and fifty-seven cents ($150.57,) (See table No. 1). By the classification of convicts as to trade, instituted the previous year, it was found that skilled workmen of almost every industry were confined in the institution. As the supplying and repairing of articles used in this line necessitated much delay and inconvenience, as well as expense in procuring, your honorable board, after investigation, authorized the purchase of such tools and materials as would be required to properly perform the work, not only in the tinner's line, but also as to piping, plumbing, and machinist work. This was done and convicts were selected to perform the labor, since which time the labor on all articles required in or about the institution that could be manufactured or repaired, both in the tin or machinist line, has been done by these convicts. Had the articles made in the tin shop been credited to this industry, even at a nominal sum, the account would have shown a profit, but all articles made have been inventoried among the various items to which they severally belong, thus leaving this account short to the above amount for material used. Both in this and the machinist industry, a great saving has been made to the State.

CONSERVATORY AND UNIFORMS.

The amounts respectively, two hundred and twelve dollars and twenty-seven cents ($212.27), and one hundred and eighteen dollars and fourteen cents ($118.14) (see table No. 1), are the amounts expended and charged to these accounts during the year.

PRISON SUPPLIES, FURNITURE AND FURNISHING WARDEN'S HOUSE.

The moneys expended and charged to these accounts are for supplies used in the prison, and furnishings for warden's house), and found in the inventories of prison supplies and warden's House. (See table No. 1).

OFFICE FURNITURE AND MATRON'S ROOM.

As shown by table No. 1, the amounts against these accounts are for the purchase of a fire-proof safe in which all books, commitment papers, and all papers of importance are kept in the office, and for a carpet in the matron's room, the items which will be found in the inventories.

ENGINES AND BOILERS, GAS PLANT AND PRISON FURNITURE.

No charge for moneys expended has been made to the above named accounts but the amount against them in table No. 1, shows the difference or shrinkage in the inventories from service over the inventory of the previous year.

MEDICINE.

By reference to table No. 1 it will be found that one thousand and ninety-four dollars and twenty-seven cents ($1,094.27) has been the actual amount expended for medicine. This amount not only covers the cost of medicine used in the care of sick prisoners, but also that used for the officers of this institution. Under date of Feby. 13, 1894, your honorable board added as a small allowance for wages to the officers of the institution residing in Wethersfield, the privilege of calling in the prison physician in case of personal sickness, the medicine used to be compounded upon the prison physician's prescription from supplies furnished to the Prison dispensary. In case of sickness among the officers this privilege has been accepted, and shows, with this addition, the expense to be at the rate of $\frac{75}{100}$ cents per capita per day (see table No. 6) of 403 (average) persons confined here.

WEST END APPROPRIATION.

Upon the request of your honorable board, after showing the necessity for additional cell room at this institution to accommodate the increasing number of prisoners, the Legislature of 1895 appropriated the sum of twenty thousand dollars ($20,000) for additional cells to be located in the west wing of the old prison in place of the old and unsuitable cells, and for the erection of a suitable number of solitary cells. This necessitated the removal of those cells located in the west wing to make room for the erection of the cells provided for by the appropriation. On the 10th day of Sept., 1895, after mature deliberation and careful examination of plans and specification and bids submitted by a number of prominent firms engaged in this class of work, your honorable board signed contracts with the Van Dorn Iron Works

Co., of Cleveland, Ohio, for the erection of 32 steel cells and 6 solitaries, complete.

The preparing of the interior and exterior of the building for the erection of these cells is being done, as far as possible, by convict labor. Immediately upon the signing of the contract, work was at once commenced on the windows of the building with prison labor. Up to Sept. 30, 1895, there had been expended the sum of four hundred and ten dollars and seventy-one cents ($410.71) (see table No. 1) in making the necessary alterations on the exterior of the building, for which as yet no moneys have been drawn from the appropriation, but paid from the funds of the institution.

NEW STOREHOUSE AND KITCHEN.

Owing to the dilapidated condition of the old storehouse and its lack of capacity to accommodate the storage of articles necessary to be kept on hand in quantities, from the fact that the warden was unable to purchase in quantities, and at times when the required articles could be bought at their lowest price; and as the old prison kitchen was not located in the proper position for the best interest and discipline of the inmates as well as from its inadequate room to meet the requirements of the increasing number of prisoners; and also from the fact that the room occupied as a kitchen was admirably fitted to meet the requirements for punishment cells and solitaries necessitated by the tearing down of those located in the west end, it was thought advisable by your honorable board to build a new storehouse on the ground of the old one, of sufficient size and accommodation to meet all the requirements of the institution, and also to build a new kitchen on the east side of the main block of such size and arrangements as to meet any contemplated future necessities.

On the 13th day of Aug., 1895, upon plans and specifications drawn by H. B. Philbrick, architect, of Hartford, Ct., and previously submitted for your approval, you contracted with The H. Wales Line Co., of Meriden, Ct., to erect these buildings, this corporation having been selected from numerous bidders in answer to advertisements soliciting bids. The buildings are in the process of erection, and the sum of four thousand, eight hundred and five dollars and sixty-four cents ($4805.64) (see table No. 1) was paid on the contract up to Sept. 30, 1895.

PROVISION FOR WARDEN'S FAMILY, OFFICERS AND PAID HELP.

It would be found by reference to table No. 1 that there has been expended for provision for the warden's family, officers and paid help the sum of five thousand six hundred and eighty-nine dollars and ninety-eight cents ($5,689.98) for the year ending September 30, 1895, and that the average number catered for has been $28\frac{25}{100}$ per day, which at the above average number would be at the cost of $55\frac{18}{100}$ cents per day for each paid employee. (See table No. 7). The Legislature being in session for several months during this fiscal year and the institution receiving frequent visits from members and committees in their official capacity and large numbers of other state officials, it seemed right and proper that the warden should entertain them. All this has been done in addition to the warden's family, officers and paid help at the small cost of $55\frac{18}{100}$ cents per day.

RECEIPTS, SALE ACCOUNT.

There has been received from the sale of various articles that have from time to time accumulated the sum of two hundred and twenty-six dollars and twenty-three cents ($226.23). (See table No. 1 for amount and table No. 3 for items.)

U. S. PRISONERS.

From the government prisoners confined here from August 1, 1892, to September 30, 1895, there has been a charge made of fifteen hundred and eighteen dollars and twenty-one cents ($1,518.21) at the rate of $2.24 per week. The government has paid seven hundred and sixty dollars and ninety-six cents ($760.96), leaving the sum of $757.25 due. A part of this amount due is in a quarter for which the administration will have to apply to Congress for a deficiency appropriation, doubtless a claim will have to be filed with the United States District court judge and the claim allowed before the institution will receive this balance.

VISITORS' RECEIPTS.

On May 14, 1895, your honorable board voted that on and after June 1, *prox.*, all admission to this institution by fee should cease and all visitors prohibited except by passes issued by the directors or warden. On June 1, 1895, there had been received from this source (see table No. 1) the sum of four hundred and thirty-one dollars and thirty-five cents ($431.35). The rule of admission by pass any day in the week did not diminish the visits but added to the labor of the officers of the institution. The only point gained was in the discrimination allowed when passes were requested. On August 19 visiting the institution was confined by a vote of your board to one day in a week (Wednesday), passes being required as before, which day, if necessary, could be given up to the showing of visitors about the institution. This course was a success and as a rule meets the approval of all.

RENT AND FINE ACCOUNTS AND CONVICT FINES.

The various sums found in table No. 1 against these accounts are thus explained, to rent—two hundred and nine dollars and four cents ($209.04) for rent of State property, known as the "Welles house" to officers of the institution; to fine account—twenty-six dollars ($26.00) as fines for minor offences against the rules of the institution, and to court fines—the sum of ten dollars ($10.00) for fines imposed upon prisoners at their conviction in addition to their sentences, and paid by their friends at the expiration of sentence.

LIVE STOCK.

Table No. 1 shows a net gain to this account of one thousand two hundred and ninety-three dollars and thirty-six cents ($1,293.36), being made up from profit accruing from sales and the increase of live stock on hand, as shown by the inventory of live stock. For the year all the pork used about the institution has been raised and fatted on the premises without expense to the State excepting for a few weeks before killing time, when meal is purchased and fed to harden the meat. At all other times sufficient refuse of the institution is furnished to keep the swine in excellent condition. Also the milk used about the institution, except a few gallons daily of creamery milk, is furnished on the place with only the outlay for feed. This result has demonstrated fully the good judgment shown by your honorable board, in directing that suitable cow barns and piggeries be erected, which work was done last year entirely by convicts even to the draughting of plans from which they were built, at an expense not exceeding two thousand dollars

($2,000.00) for the material used. From a small number of swine and five cows and yearlings on hand this industry has increased in two years to 176 pigs and shoats and six first class grade Jersey cows as shown by the inventory of September 30, 1895, after furnishing all the pork supply for the inmates, warden's family and officers' table for the past year and leaving on hand the above number from which to supply the institution the coming year.

BUILDINGS AND LAND.

This amount, seven thousand two hundred and thirteen dollars and sixty-six cents ($7,213.66) (see table No. 1) shows the increased valuation as appraised September 30, 1895, in buildings and land belonging to the institution over their valuation at the end of the fiscal year of 1894.

DIRECTORS' ROOM, FIRE ARMS AND WARDEN'S SUPPLIES.

These accounts also show a gain in valuation over the preceding year of one dollar and sixteen cents ($1.16), one dollar and twenty cents ($1.20) and ten dollars and eighty cents ($10.80) respectively. (See table No. 1).

MOTIVE POWER.

The motive power furnished to contractors necessarily comes from the use of the fuel furnished to the institution, and charged to the fuel account. The amount received from contractors has properly been deducted from the fuel account in showing the cost of heating the institution. There is no way by which the exact cost of heating can be determined owing to the fact that the coal bunkers are so arranged that the coal used for the different boilers can not be stored separately. The institution receives only twenty-five dollars ($25.00) per month for power furnished to each shop occupied by the shoe contractors, and I am still of the opinion, as explained in my report of last year, that this very small amount materially falls below the actual cost. One thousand four hundred and ten dollars and thirty-seven cents ($1,410.37) has been received from this source. [See table No. 1].

BLACKSMITHS' TOOLS AND SUPPLIES.

Since my last report there have been added to the institution a planer, a lathe, and drill. These have been placed in the building known as the blacksmith shop, thus enabling the institution to perform with convict labor all work in the line of plumbing, steam, water, and gas pipe fitting, and all class of machinist work which heretofore had to be done in Hartford at considerable expense and delay, and in many instances necessitated the hiring of outside parties to come and perform the work. Thus equipped the institution has been able to do all the repairing and new work required at great saving of both time and money. The amount to the credit side of this account as shown in table No. 1 is the income in appraisal over the cost of articles found in shop, and to some extent caused by many articles having been made by the convicts employed there from material furnished and of value to this institution.

CONVICT LABOR.

On Sept. 30, 1895 there were employed under contract in the manufacture of shoes (see contract table for details) 235 men, being one less than the number called for in the contracts and from whose works, at 50 cents per day the institution has derived an income for the year of thirty six thousand five hundred and twenty dollars and seventy-eight cents ($36,520.78). (See table No. 1). Matters connected with these contracts remain in a very pleasant and satisfactory condition, as at the time of my last report. The average number of men unemployed during the year at productive labor has been $51\frac{92}{100}$. The greatest annoyance possible has been caused from the inability of the prison officials to find remunerative labor for the large average number of prisoners remaining in forced idleness during the greater part of the year. Every available scheme for the profitable employment of these idle men has been canvassed and when practicable as many of them as possible have been utilized in such work as farming, grading of the grounds, repairing and painting of the buildings, etc. The unsatisfactory condition of those still remaining unemployed, and the loss of the income from their labor to the State, induced every effort to be made to find some suitable and permanent employment for them. Committees appointed from your honorable board at different times, with the warden, have visited several other penal institutions in adjoining states and advertised in the papers for parties to submit bids for contracts for any class of work that might seem advisable to introduce into this institution. From these efforts several applications were made by parties for the introduction of industries which upon investigation were found to be unsuited to the conditions existing here. During the early summer, however, through information gained by your committee, negotiations were opened with New York parties which led up to a contract being made under date of July 16, 1895, by your honorable board for the manufacture of bosom shirts under a plan known in penal institutions as the "piece-price plan," or so much for each dozen shirts manufactured, and if available the institution to furnish sufficient men to run 100 machines.

On Sept. 30, the last day of the fiscal year, there were in the shirt shop learning this class of work 47 convicts, all that were available. This condition of affairs positively solved the problem of convicts remaining in enforced idleness. I am unable at this time to give you any information regarding the ultimate financial success of this new industry, as it will take some time to make the men familiar with the work and to learn to run their machines to advantage. This much can be said, however, it is clean and pleasant work and is much sought after by the inmates.

PRISON LIBRARY.

By an act of the Legislature (See Section 3356, Chapter CCVII, Public Statutes) an annual appropriation is made to the warden of this institution of three hundred dollars ($300.00) for the purpose of maintaining a library for the use of convicts confined here. In accordance with this act there has been expended the past year for new books to replace old and obsolete works, for recataloguing the library and for material used in rebinding old and binding new works, the sum of five hundred and seven dollars and ninety-five cents ($507.95). On Jan. 14, 1895, there was drawn from the state treasurer the sum of four hundred and fifty-eight dollars and fifty cents ($458.50) being the balance due the warden on this appropriation Oct. 1st, 1894. By direction of the warden the prison chaplain, who acts as librarian, was authorized to recatalogue the library, purchase such new books as seemed to be required, and to withdraw such books as had become obsolete, or were of such character as seemed to be unfit to remain, in fact to thoroughly reorganize that department. This has been done and I would respectfully refer you to the chaplain's report for further details. The work of tabulating, rebinding and the binding of the new books has been done under his supervision by convict labor in the prison bookbindery at a great saving to this appropriation. As will be seen by reference to table No. 1 there is due the institution from this fund the sum of one hundred and sixty-eight dollars and seventy-three cents ($168.73). On Oct. 1, 1895, there will be due to the warden from this appropriation three hundred dollars ($300.00) from which this excess will be paid.

GENERAL REMARKS.

EXERCISE.

Continuing the practice instituted at the time of assuming charge of this institution, daily exercise of an hour in the open air of as many prisoners as can be safely handled, has been continued through the year with occasional breaks by advice of the prison physician, from either excessive hot or cold weather, and necessitated sometimes by the admission of numbers of workmen and teams employed in the erection of the buildings under contract within the walls of the institution, it not being deemed safe and would materially interfere with the contractors. Owing to the above facts the exercise of the men has been necessarily curtailed, but enough has been accorded to keep them in good physical condition and to fully confirm the opinion formed of its beneficial effects. When the buildings are completed the daily exercise will be resumed without serious interruption.

PUNISHMENTS.

Following on the lines laid down in my last report by which I have been governed in meting out punishments to fractious or disobedient prisoners, it is very gratifying to me to be able to report that the punishments inflicted for the year have materially decreased, and at no time has it been necessary to proceed to extreme measures. In an institution of this kind great effects arise from what might be considered by many as small causes, and this institution being no exception to the rule, the punishment list has varied accordingly, but has been below the average of previous years. This result has not been brought about by any relaxation of discipline, but is more directly attributed to the grading of the punishments, and the care and discrimination used in its infliction. For the first violation for minor offenses caution and advice, for a repetition a light punishment, increasing in severity as the offense recurs, at all times impressing upon the prisoner that such punishment as he receives is for correction and penalty, not for malice, and never extending the punishment beyond the time at which he is ready to acknowledge and apologize for his misdoings. The punishment for vicious offenses has to be governed by their seriousness. Care at all times is taken to investigate and become satisfied that the right party is undergoing the punishment. By this course the inmates understand that if punished they bring the infliction and its severity upon themselves by their conduct. Among an aggregation of 400 men, there will always be found incorrigible spirits, who seem to be beyond the power of reason, and are only governed by the vicious impulses of their natures. To these, the more extreme measures and their repetition has to be extended, and are largely accountable for the number of punishments inflicted. When the average prisoner learns that penalty invariably follows infraction, and that its severity is governed by its repetition, except with incorrigibles, they soon learn that there is more lost than gained, and to a great extent govern themselves accordingly. Kindness, firmness, justice, and undeviating enforcement of the rules, with the invariable punishment following their violation, has brought about this gratifying result. The number of individuals punished and the whole number of punishments inflicted, with percentages for each as compared to the total population of the institution for the year, to wit; 567, are as follows: Number of prisoners punished, 69; number of punishments inflicted, 114; percentage of individual punishments to population, $11\frac{97}{100}$ per cent.; percentage of whole number of punishments to average population, $19\frac{79}{100}$ per cent.

The above table covers all corporal punishments, such as standing to the wall; confinement in light cell on bread and water; shackled to door on bread and water during working hours; and solitary confinement. With the extended reformatory measures and gradings of prisoners permissible on the completion of the additional cells in west wing, it is confidently expected that a greater reduction in punishments can be made the coming year.

SICKNESS.

I would respectfully refer you to the prison physician's report found following, for details. Every effort has been made in the furnishing of food and clothing, the heating and ventilating, and compulsory exercise, to reduce the sick list, and I am pleased to say the effort has met with some success. It is hoped that with the changes already introduced, and with the additional ones suggested in this report, better results will be accomplished in the future.

INSANITY.

By reference to the statistical table covering the transmission of insane convicts to and from the Connecticut State prison to the Connecticut Hospital for the Insane at Middletown, it will be found that there have been delivered to that institution 25 insane convicts, and 10 returned from there by orders of the governor. In addition to the above two have died, one has been returned, two have escaped from there during the year, leaving in that institution 34 convicts still on sentence, and 9 ex-convicts who remain in the hospital because they continue insane, making 43 patients of the convict class under treatment in that institution Sept. 30, 1895. Your honorable board and the warden appeared before the Legislative committee on State Prison during the session of the Legislature of 1895, and advocated the erection of an insane ward at this institution. Although this application failed the same good and sufficient reasons for it still exist and many additional ones could be produced. It is hoped that for the best interest of the State, and particularly for this institution, you will continue your efforts in the behalf of this reform until crowned with success. The experience of the prison officials during the past year with actual insanity in its incipiency, and the efforts made by sane prisoners to be transferred to that institution, are strong arguments in favor of the project.

ESCAPES.

I am able to state with gratification that there has been no escapes since my assuming charge of this institution, although the same necessities have existed for the labor of prisoners outside the walls as during previous years and the same constant danger has menaced as before in the tangled mass of brush and weeds on the land adjoining the institution on the east, through which in the past the greater part of the escapes have been made. Some action should be taken either to purchase or lease this land and the ground cleared and cultivated.

BIRTH.

A convict named Emma Tinkham, committed for 2 years from Hartford County, March 15, 1894, for manslaughter, gave birth to a male child on Nov. 22, 1894. (See surgeon's report.) As soon as the child reached the proper age, it was removed by the woman's friends. Her affidavit regarding the case, showing that her condition was attributable to her conduct prior to her admission, remains on file in this office.

DEATHS.

Out of a total population of 567 for the year and a daily average of 403 convicts confined here during that time, there have been twelve deaths, none of whom were life prisoners. The perceptable reduction over last year, shown by the following comparison tables of percentages for the two years, has been brought about by the constant effort of every official connected with the institution, and to improved methods, as explained in detail through this report. Two years is too short a time in which to derive the full benefit accruing from the improved surroundings and efforts made to reduce the annual sick and death rate of the institution. The showing made during the last year over the preceding year gives sufficient guarantee however that we are on the right track, and still better results may be expected in the future. Full particulars of the sickness, cause of death, and other details in connection with this subject will be found in the physician's report.

TABLE OF DEATH RATE.

Number of deaths from Oct. 1, 1894, to Sept. 30, 1895,	12
Total population of institution " " "	567
Average " " " " " " "	403
Percentage of death rate to population " "	$2\frac{116}{1000}$
" " " average " " "	$2\frac{9}{10}$
Annual death rate per 1000 of population " "	$21\frac{16}{100}$
" " " " average " " "	$29\frac{77}{100}$
No. of deaths for the 14 mos. from Aug. 1 1893 to Sept. 30 1894	18
Total population of institution " " " "	538
Average population " " " " "	351
Percentage of death rate to population " " "	$3\frac{34}{100}$
" " " average " " " "	$5\frac{12}{100}$
Annual death rate per 1000 of population " " "	$33\frac{45}{100}$
" " " " average " " " "	$43\frac{95}{100}$

EXECUTION.

On Dec. 18, 1894, at 1:02 A. M., John Cronin, condemned to be hung Aug. 24, 1894, for the murder of Albert Skinner, of East Windsor, after having been twice reprieved, was executed at this institution in accordance with Chapter CXXXVII of Public Acts of the State of Connecticut, January Session, 1893. The best efforts of all the officials of this institution were invoked to make the execution the most orderly, expeditious and humane that had ever taken place in the State, with what success I leave to you, gentlemen, who were present, and to the witnesses admitted by law.

The condemned man was accompanied to the execution room by his spiritual advisors, the Revs. Father Broderick and Lynch, of St. Peter's Parish, of Hartford, and met his death calmly. In fifty seconds from the time of leaving his cell he had paid the death penalty; twenty seconds only of the whole time being spent upon the trap. His body was buried in Blue Hills cemetery by the State. I desire at this time to express my appreciation to Deputy Warden Baisden, Prison Physician Fox, and Officers Doolittle and Perkins, who were directly associated with me in this execution, for the cool and efficient manner in which they performed their gruesome duties, and to the other officers of the institution my thanks for their promptness and accuracy in carrying out the details devolving upon them. John Cronin was born at Dowlias, Glamorganshire, Wales, Aug. 17, 1856; condemned to be hung Aug. 24, 1894; reprieved to Oct. 24, 1894; again reprieved to Dec. 18, 1894; executed Dec. 18, 1894, at 1:02 A. M.

DISCIPLINE.

It is confidently asserted that at no time during the history has there been better discipline, or greater loyalty and devotion shown to the interests of the institution by the officers as a whole, than at the present time. Courtesy in their intercourse with one another; promptness and ability in the performance of their duties; and kindness, with firmness, in their treatment of the prisoners, has tended greatly to the present satisfactory moral of the institution. Respectful attention and prompt obedience is generally manifested by the prisoners in their relations with the officers. This result is very gratifying to me and my thanks are extended to the officers of this institution for the able and efficient manner in which they have performed their several duties, and for their efforts to obtain these very satisfactory results.

On August 9, 1895, at about 2 A. M., the driving team belonging to the institution, consisting of a pair of horses, harnesses, and surrey, with mats and whip, were stolen from the prison barn, located outside of the walls of the institution. The thief gained admission by wrenching the fastenings from the doors and gates, and passed out to the highway in the rear of the institution through lands used for farming and gardening purposes. By prompt action the property was recovered at New Haven, about 1 P. M. of the same date, and the thief, Raymond R. Perkins, captured shortly afterwards. He is now serving a ten year sentence for the crime. He was discharged from the institution on Aug. 26, 1894, having served a five year sentence for theft. Being a carpenter by occupation he had been employed about the premises and was familiar with the place. Other articles stolen by him were also recovered.

I desire at this time to call your attention to the present inadequate system in vogue here for the identification of convicts should any escape, or afterwards be re-committed for future crimes. The present system of recording the height, age, weight, color of eyes and hair, and complexion, forms no definite mode of identification. With time and conditions many of these identifying marks change, leaving to memory only the peculiarities of the person in gait or speech as means of recognition. For years there has been in use in foreign penal institutions a mode of identification called the Bertillon Method, which consists of a photograph, both in profile and full face view of the prisoner, an exact measurement of his height, length and width of head, of the left foot, the outstretched arms the trunk of the person seated, the four fingers of the left hand, the left arm and length of ear, together with the color of the eyes and any particular distinguishing marks. As will be seen, all the measurements mentioned are those of the bone dimensions of the human body, which remain unchanged after the body has attained its mature growth. It is conceded that the bones of no two mature persons are the same in length. The ear in its length and width and general formation varies with each individual, and forms a distinctive feature for identification.

This method has been introduced into a dozen or more penal institutions in the United States, and is meeting with deserved success. It was highly recommended at the National Congress of Wardens held at St. Paul, Minn., in June, 1894, by those who had demonstrated its practical advantages, and it is also warmly endorsed by prison experts generally. It assures positive identification. The expense of its introduction is merely nominal.

In conclusion I would respectfully again impress upon your attention the several recommendations that have been presented in this report and ask for them your serious consideration.

To Deputy Warden Baisden, Physician Fox, and Chaplain Moses, I am greatly indebted for their efforts in their several departments, and again express my appreciation of services rendered.

To the present and to the ex-members of the honorable board of state prison directors I desire to express my gratitude for the encouragement and kindly advice given, and to record my thanks for their courteous treatment during my administration as Warden of this institution.

Trusting that my efforts have met your approval,

I have the honor to remain,

Yours very respectfully,

JABEZ L. WOODBRIDGE,

Warden.

REPORT OF
PHYSICIAN AND SURGEON.

To the Honorable Board of Directors of Connecticut State Prison,
JAMES W. CHENEY, President.

GENTLEMEN:—

I have the honor to submit my report of the medical department of the Connecticut State Prison for the year ending September 30, 1895.

The average amount of sickness the past year was less than the preceding year, with the exception of January and February, when nearly one-third (⅓) were sufferers from "La Grippe." Three (3) deaths were hastened by this epidemic. An old man who had been in the hospital a number of years and was very feeble succumbed, and two (2) others suffering from phthisis (consumption) hastened their death.

During the above period there have been sixty-eight (68) cases treated in the hospital.

Twelve (12) have died during the year. Phthisis pulmonalis (4), cerebral apoplexy (2), abscess of thyroid gland, cardiac dilitation, cardiac dropsy, la grippe, chronic diarrhœa, pulmonary apoplexy, each one (1).

John Cronin, a convict, was executed by order of the court, December 18, 1894.

The total number of convicts in confinement during the year was five hundred and sixty-seven (567); of these twelve (12) died, which makes the precentage of deaths $2\frac{12}{100}$.

At the present time there are twelve (12) confined in the hospital. Of this number six (6) are suffering from phthisis pulmonalis; two (2) of these are in the incipient stage. Valvular disease of the heart, hepatitis, inflammatory rheumatism, mangled hand, malarial fever, hemorrhage of lungs, each one (1).

As in every penal institution pulmonary consumption is the principal disease, although the death rate the past year from that disease has been less than previous years.

During the winter season each convict of consumptive or rheumatic tendency is furnished with red flannel underwear.

The number of men from the shops on the "sick list" for the past year is as follows:

1894.	
October,	590
November,	542
December,	577
1895.	
January,	619
February,	568
March,	618
April,	569
May,	623
June,	554
July,	545
August,	701
September,	523
Total,	7,029

The above does not include the female department or those sick in the hospital.

There is a class of patients who without being much sick may think themselves so—hypochondriacs, we may call them—whom it would not be judicious to turn away without one drop of comfort in the shape or semblance of medicine, for whether inside or outside of prison walls there are those who sincerely believe in the necessity of taking medicine. Then there is a class, who impelled by a love of change or aversion to their shops, apply for relief. Some are quite persistent and hope by repeating their demand to have it granted.

During the above period there have been one hundred and eighty-nine (189) males admitted, the proportion of sound men has somewhat increased since the last report, about two-thirds (⅔) of this number were intemperate, many being broken down by their own vicious habits previous to entering prison.

During the past year the lunacy commission have examined and declared insane twenty-five (25), they being sent to the Connecticut Hospital for the Insane; ten (10) have been returned from that institution as cured.

A number of other cases of temporary mental disturbances have occurred, the result of vicious habits requiring energetic treatment for a short time, resulting in restoration to normal health.

November 22, 1894, Emma Tinkham, a convict, gave birth to a boy. Mother and child were properly cared for and made a good recovery.

I acknowledge with pleasure the valuable aid the warden, deputy warden, and all the other officers of the prison have given me in the discharge of my duties.

Respectfully submitted,
EDWARD G. FOX, M. D.,
Physician and Surgeon to Conn. State Prison.

WETHERSFIELD, September 30, 1895.

REPORT OF
PROTESTANT CHAPLAIN.

To the Honorable Board of Directors of the Connecticut State Prison,
Hon. JAMES W. CHEENEY, Chairman.

GENTLEMEN:—

Another year with its many cares and responsibilities has passed since I addressed you. During that time many unfortunates have come under the moral and spiritual care of the chaplain of this institution of which you are in charge.

The labor of the chaplain is, while ever constant, still somewhat monotonous. The usual Sunday school work referred to in my last report has been continued, with, I think, an increase of attendance, the total averaging over 200 at each session. The faithful attendance and instruction of the excellent corps of teachers has continued the same as heretofore.

The usual chapel service has under the rules of the institution been maintained by a full attendance and an apparent interest manifested in the preaching of the Gospel truth.

The Monday evening meeting has been well sustained both in numbers and interest during the past year up to July 1, when it was thought advisable to close it for two months. It was opened the first Monday evening in September, though with a less number in attendance than when it closed, as several of its attendants were discharged during the months of July and August. But new persons have taken their places until at this time, October 1, there are on the list 18 who attend with good regularity. I presume the full number, 25, will be reached soon.

The evening schools have been well improved during the past year. All the seats, 20 in number, were full up to the vacation which it was thought best to take during July and August. Many of those who were in the school were able during the vacation to draw books from the library for reading during their leisure time, and also to write their own letters to their friends.

The library has fully been reorganized during the past year. The work was begun the 1st of October, 1894, and concluded the 1st of May following. About 150 volumes were discarded as not being proper books, because of their, to use a common, though expressive phrase, "blood and thunder" style. Many good books were worn out and needed to be replaced. One hundred and ten volumes were purchased to replace those worn out and 514 new books were added, so that we now have in the library aside from duplicates 2,655 volumes; including duplicates, a little over 3,000. These were re-catalogued and new catalogues furnished. The library is one that the institution may well feel proud of and that it is much appreciated by the inmates is proven by the fact that about 475 volumes are weekly drawn by them or about 24,700 during the year.

As to the quality of the books, a full catalogue is herewith submitted for your inspection.

Beginning October 1, 1894, by request of the warden, the chaplain has kept a record of the letters received by the prisoners, by whom written and from where; also of those written by the prisoners, to whom sent and where. It has added a considerable to the labors of the Chaplain in the way of clerical work. The number of letters received average nearly 100 weekly. The number sent out every two weeks run from 90 to 140, or an average of about 115 twice each month, making a little short of 7,000 to record during the year. I herewith submit the Letter Record Book for your inspection.

During the fall and winter of 1894–5 there were given seven special entertainments for the instruction and amusement of the prisoners. They were held in the chapel and consisted of musicals, sleight-of-hand, singing, recitations, and tableaux. They were all of a high order. There were also special services on the holidays of Thanksgiving and Christmas, making nine entertainments in all.

Respectfully submitted,

DIGHTON MOSES,

Chaplain.

REPORT OF
CATHOLIC CHAPLAIN.

To the Directors of the Connecticut State Prison.

GENTLEMEN:—

Our last report to the directors of the Connecticut State prison was submitted to that Honorable Board in 1891. Since then we have continued to minister to the spiritual wants of the Catholic prisoners on the same lines that were in vogue previous to that time.

Religious services are held on the second Sunday of every month, in the Prison Chapel. These services have been held regularly and consist of the Mass, as well as an instruction suitable to the requirements of the prisoners and in keeping with the teachings of the Church.

Twice during the year, about Christmas and Easter, the prisoners enjoy the privilege of receiving the Sacraments of Penance and Eucharist.

It is also our custom to visit the prisoners personally if they be sick, in order that they receive the consolations of religion. In our work among the prisoners we receive very valuable assistance from a society known as the Young Men's Prison Association. This association is under our care, and the members are chosen on account of certain qualifications which fit them for the important work intrusted to them. The members in their turn visit the prison every Sunday, and during the hour devoted to Sunday school they teach Christian doctrine to the prisoners.

Every Sunday we distribute among the members of the Sunday School class a number of religious papers and periodicals. The prison library contains a limited number of Catholic books, which we are desirous of increasing, believing that good reading is a powerful means in the education and uplifting of men. Since our last report we have, by the kindness of Warden Woodbridge, been able to add some forty volumes to this branch of the library.

We return thanks for this, and also for the annual appropriation, which assists us to defray the expense incurred in carrying on our work at the prison.

To Warden Woodbridge we are indebted for having the chapel altar repainted and put in a condition conformable to the purpose for which it is used.

We wish also to acknowledge many personal acts of kindness received from the warden, and the courtesy shown to us by his subordinate officers.

I am respectfully yours,

JOHN T. LYNCH.

WETHERSFIELD, Sept. 30, 1895.

FINANCIAL TABLES.

TABLE NO. 1.

PROFIT AND LOSS ACCOUNT.

From October 1, 1894, to September 30, 1895.

JABEZ L. WOODBRIDGE, *Warden.*

To	Permanent improvements,	$7,213.66
	Storehouse and kitchen,	4,805.64
	Improvements and repairs,	3,571.39
	Hospital and prison provisions,	10,859.62
	Farm account,	979.28
	Expense account,	3,939.56
	Officers' quarters,	284.16
	Chapel,	611.89
	Prisoners' tobacco,	477.40
	Advertising account,	151.41
	Amusement account,	5.50
	Night school,	73.25
	Transportation of convicts,	41.25
	Conservatory,	212.27
	Execution house,	48.73
	Uniforms account,	118.14
	Insurance account,	196.42
	Warden's provisions,	5,689.98
	Prison supplies,	2,312.21
	Light, fuel, and water,	7,070.75
	Clothing and bedding,	3,164.90
	Prison furniture,	488.37
	Matron's room,	30.03
	Tinners' tools and supplies,	150.57
	Furnishing warden's house,	244.68
	Engines and boilers,	290.00
	Gas plant,	350.00
	Office Furniture,	145.00
	West End appropriation,	410.71
	Medicine,	1,094.27
	Salaries,	25,069.10
		$80,100.14

Credit.

By Sale account,	226.23
U. S. prisoners' account,	1,518.21
Visitors' receipts,	431.35
Rent account,	209.04
Fine account,	26.00
Court fines,	10.00
Live stock account,	1,293.36
Buildings and land,	7,213.66
Convict labor,	36,520.78
Motive power,	1,410.37
Furnishing director's room,	1.16
Blacksmith's tools and supplies,	229.73
Fire arms,	1.20
Warden's supplies,	10.08
Library account,	168.73
State of Connecticut,	30,830.24
	$80,100.14

TABLE NO. 2.

RECEIPTS AND EXPENDITURES.

Summary.

Received of Comptroller from September 30, 1894, to October 1, 1895,	$39,475.55	
Excess of accounts payable over accounts receivable September 30, 1895,	3,312.18—	$42,787.73

Per Contra.

Increase of inventory from September 30, 1894, to October 7, 1895,	$11,418.48	
Cash on hand September 30, 1895,	539.01—	11,957.49
Balance to profit and loss account,		$30,830.24

TABLE NO. 3.

SALE ACCOUNT.

1894.			
Oct.	18.	Grease,	$34.20
Nov.	1.	Old barrels,	2.00
	30.	104 flour barrels, 16⅔ cts.,	17.33
Dec.	6.	Old barrels,	1.50
1895.			
Mar.	23.	Rent of bus,	5.00
May	1.	Rags and paper,	21.29
		Pig,	2.38
June	1.	Barrels,	40.95
July	31.	177 empty barrels,	29.50
Aug.	14.	9,620 lbs. old iron,	14.43
	31.	3,250 lbs. scrap leather, $4,	6.50
		Telephone,	2.40
		Empty barrel,	1.25
Sept.	3.	Grease,	25.00
	30.	123 flour barrels,	20.50
		Molasses barrel and hogshead,	2.00
			$226.23

TABLE NO. 4.

INVENTORY, SEPTEMBER 30, 1894.

Real estate, comprising State prison buildings, warden's house, Welles house, deputy's house, barns and outbuildings, with about 24 acres of land, at	$362,985.00	
Engines and boilers,	4,098,00	
Steam plant,	3,900.00	
Gas plant,	1,775.00	
Generator,	350.00	
Personal property,	27,116.25—	$400,224.25

SIMEON HALE,
E. G. WOODHOUSE, } *Appraisers under oath.*

WETHERSFIELD, Oct. 17, 1894.

Sworn to before me this 17th day of October, 1894.

H. KIRK WOODBRIDGE,
Notary Public.

Inventory, September 30, 1895.

Real estate, comprising State prison buildings, warden's house, Welles house, deputy's house, barns and outbuildings, with about 24 acres of land, at	$370,198.66	
Engines and boilers,	8,008.00	
Gas plant,	1,775.00	
Personal property,	31,661.07—	$411,642.73

WETHERSFIELD, CONN., Oct. 30, 1895.

Personally appeared before me, Albert G. Smith, and Henry P. Bliss, appraisers by authority of Chapter CCLXI Public Acts of the State of Connecticut, and made oath to the above appraisal.

H. KIRK WOODBRIDGE,
Notary Public.

TABLE NO. 5.

CERTIFICATE OF AUDITORS.

This certifies that we have examined the account, of Jabez L. Woodbridge, warden of the Connecticut State prison, from October 1, 1894, to September 30, 1895, inclusive, the end of the fiscal year, and compared them with the vouchers, and find them correct, showing a balance on hand on September 30, 1895, amounting to the sum of five hundred and thirty-nine dollars ($539.01) and one cent.

We found the vouchers for all expenses of the Institution in a most satisfactory condition.

OSCAR LEACH,
E. LIVINGSTON WELLS,
Auditors of Public Accounts.

WETHERSFIELD, CONN., Nov. 14, 1895.

TABLE NO. 6.

PER DIEM MAINTENANCE.

Cost per Capita of Prisoners in Confinement from October 1, 1894, to September 30, 1895.

Salaries,			$25,069.10—	.1729
Prison and hospital provisions,		$13,442.22		
Less inventory,		2,582.60—	$10,859.62—	.0748
Light, fuel, and water,		12,800.17		
Less inventory,	$5729.42	7,139,79—	5,660.38—	.0390
Less motive power receipts,	1,410.37			
Clothing and bedding,		5,837.52		
Less inventory,		2,672.62—	3,164.90—	.0218
Medicine,		1,449.27		
Less inventory,		355.00—	1,094.27—	.0075
Tobacco,		514.90		
Less inventory,		37.50—	477.40—	.0033
Total,				.3193

Average number of prisoners per month, 403.

TABLE NO. 7.

Cost Per Capita of Warden's Family, Officers, and Paid Help from October 1, 1894, to September 30, 1895, at an average of 28.25 persons per month:—

Total cost of provisions,	$5,829.16
Less inventory,	139.18
	$5,689.98

Cost *per capita* per day, .5518.

STATISTICAL TABLES.

ROSTER OF CONVICTS CONFINED IN CONNECTICUT STATE PRISON, SEPTEMBER 30, 1895.

Name.	Age when committed.	Age at present.	Occupation.	Nativity.	Where Convicted.	When Committed.	Crime.	Sentence.	Remarks.
Allen, George,	33	51	Farmer,	Connecticut,	Bridgeport,	Sept. 7, 1877,	Murder, 2d degree,	Life.	
Alexander, Lorena,	44	61	Housewife,	New York,	Bridgeport,	Nov. 8, 1878,	Murder, 2d degree,	Life.	
Albrecht, Walter,	26	29	Butcher,	Germany.	Hartford,	Sept. 16, 1892,	Rape,	Life.	
Allen, Ernest,	22	23	Waiter,	Connecticut,	Bridgeport,	Mch. 7, 1894,	Burglary,	2 years.	
Avon, Joseph,	21	24	Machinist,	R. Island,	New London,	Sept. 20, 1892,	Burglary,	4 years.	*Alias* Joseph Burke,
Alcorn, Samuel,	44	45	Mach. bl'ksm'h,	Connecticut,	Hartford.	Dec. 5, 1894,	Theft,	2 years.	Sent to Insane Hosp.
Anderson, Charles,	26	27	Sailor,	Sweden,	New London,	Jan. 12, 1894,	Theft,	3 years.	July 15, 1893; ret.
Bassett, Frank,	24	40	Laborer,	Connecticut,	Bridgeport,	Mch. 1, 1879,	Murder, 2d degree,	Life.	pris, Apr. 23, 1894.
Battis, George,	33	36	Wheelwright,	Switzerland,	New Haven,	April 14, 1892,	Manslaughter,	10 years.	$1 fine.
Baker, George,	38	41	Hatter,	Connecticut;	Hartford,	June 6, 1893,	Statutory burglary,	4 years.	3 indictments, 2, 1, 1.
Bascom, Napoleon,	33	36	Grainer,	New York,	Hartford,	June 6, 1893,	Theft,	3 years.	
Bassett, David,	26	27	Blacksmith,	Connecticut,	Bridgeport,	Mch. 2, 1894,	Horse stealing,	2 years.	
Bagshaw, John H.,	22	22	Carpenter,	Connecticut,	New Haven,	Jan. 2, 1895,	Forgery,	1 year.	
Barney, Albert,	60	60	Blacksmith,	Connecticut,	New Haven,	April 2. 1895,	Statutory burglary,	2 years.	
Bellware, Hazen,	45	50	Laborer,	Canada,	Hartford,	Dec. 19, 1890,	Murder, 2d degree,	Life.	
Bender. Connie,	18	19	Errand boy,	Russia,	Danbury,	May 19, 1894,	Burglary,	2 years.	
Beaudouin, Wilfred,	20	20	Laborer,	Canada,	New Haven,	Oct. 19, 1894,	Statutory burglary,	18 mos.	
Benoit, Napoleon,	22	22	Millhand,	Canada,	Windam,	Dec. 11, 1894,	Burglary,	1 year.	
Bishop, Wesley W.,	33	49	Druggist,	Connecticut,	Norwich,	May 20, 1879,	Murder, 2d degree,	Life.	
Booth, John,	41	46	Fireman,	Mass.,	New Haven,	April 25, 1893,	Burglary,	3 years.	
Bonner, Robert C.,	27	27	Salesman,	New York,	Norwich,	Jan. 29, 1895,	Attpt. to com. rape,	5½ yrs.	
Bowers, Frank,	22	22	Laborer,	Canada,	New Haven,	Feb. 19, 1895,	Burglary,	15 mos.	
Bradley, George,	24	30	Laborer,	Connecticut,	Hartford,	June 5, 1889,	Murder, 2d degree,	Life.	
Brown, Joseph (2),	31	35	Barber,	Pa.	Bridgeport,	Sept. 9, 1891,	Burglary,	7 years.	3 indictments, 5, 1, 1.
Brown, Reuben R.,	61	62	Farmer,	Connecticut,	New London,	Jan. 5, 1894,	Assault, int. murder,	10 years.	
Brazee, Daniel,	69	70	Handyman,	Mass.	Litchfield,	Oct. 9, 1894,	Burg. in day time,	2 years.	
Bradley, Oliver,	32	33	Groom,	Ireland,	Danbury,	Oct. 18, 1894,	Theft from person,	2 years.	
Brennen, Patrick,	26	26	Hostler,	Ireland,	Winchester,	Dec. 4, 1894,	Burglary,	3½ yrs.	
Brown, William,	20	20	Cook,	New York,	Bridgeport,	Feb. 21, 1895,	Burglary,	2 years.	

Brown, Frank E.,	28	28	Painter,	Canada,	New Haven,	Mch.	22, 1895,	Counterfeiting,	5 years.	*Alias* George Allen, Sentenced by U. S. District Court.
Buckholtz, William,	25	40	Bookkeeper,	Germany,	Bridgeport,	June	1, 1880,	Murder, 2d degree,	Life.	
Burnham, Wm. H.,	41	44	Butcher,	Connecticut,	New Haven,	Oct.	12, 1892.	Rape,	5 years.	
Burr, Herbert,	23	24	Electrician,	Connecticut,	Bridgeport,	Mch.	2, 1894,	Horse stealing,	2 years.	
Burns, John (2),	33	34	Laborer,	Connecticut,	Bridgeport,	Feb.	20. 1894.	Theft from person,	2 years.	
Burns, William,	23	23	Brass polisher,	Connecticut,	New Haven,	April	3, 1895,	Statutory burglary,	1 year.	
Burns, Edward,	34	34	Machinist,	Ireland,	Danbury,	May	16, 1895,	Burglary,	18 mos.	
Butterfield, Edward,	36	36	Carpenter,	France,	Hartford,	June	4. 1895,	Statutory burglary,	2 years.	
Caples, Wallace,	19	20	Painter,	Connecticut,	Windham,	May	23. 1894,	Burglary,	3 years.	Negro.
Carey, John C.,	28	28	Laborer,	Ireland,	Norwich,	Jan.	3, 1895,	Intent to com. rape,	3½ yrs.	
Caruzo, Lorenzo,	44	44	Laborer,	Italy.	New Haven,	July	2, 1895,	Murder, 2d degree,	Life.	
Chamberlain, H. B.,	22	30	Clerk,	Connecticut,	New Haven,	July	18, 1887,	Murder, 2d degree,	Life.	
Cheesebro, Joseph,	48	50	Hatter,	Connecticut,	Middletown,	April	5, 1893,	Burning barn,	5 years.	Negro, 2d commitment.
Clyde, Walter,	36	41	Barber,	Cuba,	Bridgeport,	Sept.	10, 1890,	Burglary,	6 years.	Negro.
Clark, William,	22	24	Laborer,	New Jersey,	New London,	Sept.	5, 1893,	Burglary,	2½ yrs.	
Clume, Martin,	26	28	Steel polisher,	New York,	Haddam,	Sept.	27, 1893,	Statutory burglary,	2½ yrs.	Sent to Ins. Hospital Mch. 15, 1895; ret. pris. June 18, 1895.
Clark, Charles,	40	41	Tool-maker,	Connecticut,	Bridgeport,	Mch.	2, 1894,	Rape,	20 years.	
Clemens, Samuel,	20	21	Farmer,	Connecticut,	Putnam,	Sept.	4, 1894,	Horse stealing,	2 years.	
Clark, James,	37	38	Laborer,	Mass.,	Litchfield,	Oct.	10, 1894,	Burglary,	3 years.	
Cobb, Kate,	31	47	Housewife.	Connecticut,	Norwich,	Jan.	17, 1879,	Murder, 2d degree,	Life.	
Conant, Frank V.,	34	45	Salesman,	Mass.,	New London,	Oct.	15, 1884,	Murder, 2d degree,	Life.	
Coyle, Richard,	58	67	Cloth finisher,	Ireland,	Norwich,	May	4, 1886,	Murder, 2d degree,	Life.	
Corbett, Joseph,	29	30	Quarryman,	Mass.,	Bridgeport,	Mch.	2, 1894,	Burglary,	15 years.	
Connors, John,	26	27	Fireman,	Connecticut.	Hartford,	Mch.	7, 1894,	Statutory burglary,	2½ yrs.	
Costello, James,	28	29	Laborer.	Connecticut,	Tolland,	April	20, 1894,	Burglary, 4 counts,	6½ yrs.	
Coats, William,	40	41	Machinist,	Ireland,	Danbury,	May	9, 1894,	Unlawful cohabita.,	2 years.	
Corbett, James,	27	28	R. R. man,	New York,	Norwich,	June	5, 1895,	Horse stealing,	2 years.	
Coyne, James,	29	30	Laborer,	Connecticut,	Hartford,	June	12, 1894,	Theft from person.	2 years.	
Colby, John W.,	35	36	Farmer,	Connecticut,	Litchfield,	Oct.	9, 1894,	Burglary,	4 years.	2d commitment.
Connors, John (2),	25	25	Cook,	Connecticut,	Hartford,	Dec.	4, 1894,	Statutory burglary,	2 years.	
Corey, Joseph,	20	20	Hostler,	Connecticut,	Windham,	Dec.	11, 1894,	Burglary,	18 mos.	
Conley, John,	35	35	Laborer,	Ireland,	New Haven,	Jan.	4, 1895,	Burglary,	2 years.	
Cooper, George,	20	20	Silver chaser,	R. Island,	Putnam,	Mch.	13, 1895,	Stealing bicycle,	14 mos.	
Conroy, John,	46	46	Fireman,	Ireland,	Danbury.	May	17, 1895,	Theft from person,	3 years.	
Connell, John,	22	22	Woolcarder,	Connecticut,	Norwich,	May	23, 1895,	Ass'lt,attpt.com.rape	5 years.	
Cooper, Charles,	25	25	Sailor,	England,	Norwich,	May	7, 1895,	Burglary,	3 years.	

ROSTER OF CONVICTS CONFINED IN CONNECTICUT STATE PRISON, SEPTEMBER 30, 1895.—*Continued.*

NAME.	Age when committed.	Age at present.	Occupation.	Nativity.	Where convicted.	When committed.	Crime.	Sentence.	Remarks.
Cockefur, George,	17	17	Farmer,	Connecticut,	Bridgeport,	Sept. 11, 1895,	Horse theft,	2 years.	
Corporal, Carl,	60	60	Farmer,	Italy,	Bridgeport,	Sept. 11, 1895,	Assault, int. to rape,	1 year.	
Crandall, Charles,	25	32	Milk peddler,	Indiana,	Middletown,	Dec. 4, 1888,	Rape,	15 years.	
Crawford Charles,	32	33	Marine fireman,	New York,	Danbury,	May 23, 1894,	Burglary,	2 years.	
Cruise, Patrick,	23	24	Hostler,	Connecticut,	Bridgeport,	Sept. 11, 1894,	Horse theft,	2 years.	
Cronnen, John,	52	53	Laborer,	Connecticut,	Hartford,	Sept. 11, 1894,	Assault, int. murder,	18 years.	5th commitment.
Cronnin, Thomas,	26	27	Hostler,	Connecticut,	Haddam,	Sept. 26, 1894,	Robbery,	5½ yrs.	
Curry, James,	27	29	Harness maker,	Connecticut,	Hartford,	Dec. 8, 1893,	Statutory burglary,	3 years.	2d commitment.
Curtis, George E.,	26	28	Reporter,	Illinois,	Bridgeport,	Sept. 21, 1893,	Horse theft,	3½ yrs.	
Curley, John,	32	34	Groom,	Pa.	Hartford,	Dec. 12, 1893,	Sta. burg. and theft,	1½ yrs.	
Cunningham, Jno. (2),	30	31	Polisher,	Connecticut,	Waterbury,	Feb. 21, 1894,	Burglary,	2 years.	
Curran, Peter,	19	19	Porter,	Mass.,	New Haven,	April 3, 1895,	Burglary,	3 years.	
Cummings, John,	25	25	Marine fireman,	P. E. Island,	New Haven,	April 2, 1895,	As't int. steal fr. per.	2 years.	2 commitments; 4, 6;
Davis, John H.,	27	43	Laborer,	Mass.,	Hartford,	April 3, 1879,	Murder, 2d degree,	Life.	Russian name Do-
Daly, Mary,	45	48	Housewife,	Ireland,	Windham,	Jan. 20, 1892,	Murder, 2d degree,	Life.	linski, *alias* J. W.
Daly, William,	21	22	Laborer,	Russia,	Hartford,	Sept. 12, 1894,	Horse stealing, 2 co.	10 years.	Murphy.
Davis, John (2),	74	75	Speculator,	New York,	Hartford,	Dec. 7, 1894,	Forgery,	8 years.	Sentenced by U. S.
Daley, John,	23	23	Weaver,	New York,	New Haven,	Feb. 20, 1895,	Attempt com. rape,	2 years.	District Court.
Darl, Frank,	19	20	Book-keeper,	Connecticut,	Danbury,	May 9, 1894,	Horse theft,	2 years.	
Derick, William,	21	24	Farmer,	Virginia,	New Haven,	Oct. 13, 1893,	Assault int. to kill,	5 years,	Negro.
Dewey, Henry,	30	30	Weaver,	England,	Tolland,	April 9, 1895,	Burglary,	5 years.	4 and 5 years, one to
Dean, William,	29	29	Laster,	Connecticut,	Bridgeport,	Sept. 11, 1895,	As. int. kill. 2 co. burg.	9 years.	take effect at the ex-
Dixon, Richard,	38	39	Lithographer,	Connecticut,	Hartford,	Sept. 11, 1894,	Burglary,	5 years.	pira. of the other.
Divose, Louis,	27	28	Laborer,	Italy,	Danbury,	Oct. 23, 1894,	Assault int. rape,	3 years.	*Alias* Louis Ammonny.
Doe, John,	25	34	Farmer,	Mass.,	Bridgeport,	Sept. 14, 1886,	Burglary,	16 years.	*alias* Ed. Rider, 2d com.
Dougherty, John,	52	53	Laborer,	Ireland,	Bridgeport,	Feb. 28, 1894,	Theft,	2 years.	2 indictments, 8, 8.
Dougherty, Andrew,	30	31	Steam fitter,	Connecticut,	Bridgeport,	Feb. 21, 1894,	Theft, burglary,	2¼ yrs.	2 sent., 1 yr. & 15 mos.
Dorris, John,	32	33	Laborer,	New York,	Hartford,	June 5, 1894,	Theft from person,	4 years.	
Donovan, Michael,	46	47	Laborer,	Connecticut,	Norwich,	June 5, 1894,	Murder, 2d degree,	Life.	

Doe, John (2),	24	25	Sailor,	Denmark,	New Haven,	Oct.	3, 1894,	Theft,	3 years.	*Alias* Er'sm's Anderson
Dolan, James,	36	36	Stonemason,	Connecticut,	New Haven,	Feb.	19, 1895,	Burglary,	15 mos.	
Driggs, Ernest,	18	19	Farmer,	Connecticut,	Hartford,	June	5, 1894,	Burglary,	7 years.	
Driscoll, Cornelius,	19	20	R. R. man,	Pa.,	Windham,	Dec.	13, 1894,	Theft from person,	1 year.	
Dunn, Thomas (1),	59	64	Gardener,	Ireland,	Bridgeport,	June	5, 1890,	Manslaughter,	7 years.	
Duprey, Joseph,	20	22	Timber cutter,	Pa.,	Middletown,	April	4, 1893,	Burglary,	15 years.	4 indictments, 5, 5, 4, 1.
Dumpson, Oscar,	17	18	Box builder,	Ohio,	New Haven,	July	9, 1894,	Plac. obs. R. R, track	6 years.	Negro.
Duffy, Henry,	32	33	Needle maker,	Connecticut,	Hartford,	Dec.	5, 1894,	Theft,	2 years.	
Duckworth, James,	23	23	Laborer,	England,	Bridgeport,	Feb.	20, 1895,	Attempt at burglary,	1 year.	
Durbin, John E.,	32	32	Barber,	Virginia,	Bridgeport,	Sept.	13, 1895,	Robbery,	5 years.	
Dunn, Julian,	29	29	Teamster,	New York,	Hartford,	Sept.	18, 1895,	Theft from person,	1½ yrs.	
Dynes, John,	19	42	Shoemaker,	Connecticut,	Hartford,	Sept.	23, 1873,	Murder, 2d degree,	Life.	Ret. fr. Mid'n No. 28, '92
Edmunds, Charles P.,	39	41	Farmer,	Connecticut,	New Haven,	Oct.	6, 1893,	Statutory burglary,	2½ yrs.	Negro—At. sui. Mar.
Edwards, George,	20	20	Cooper,	Connecticut,	Norwich,	Jan.	16, 1895,	Statutory burglary,	1 year.	23,'83, I. H. Nov. 17,
Ellis, Jefferson,	34	50	Sailor,	New York,	Haddam,	Dec.	12, 1879,	Murder, 2d degree,	Life.	'93; Ret. Ap. 23,'94
Ellis, Thomas,	34	34	Laborer,	R. Island,	Norwich,	Jan.	2, 1895,	Burglary,	2 years.	2d commitment.
Emerson, Richard,	22	22	Teamster,	Connecticut,	New Haven,	April	2, 1895,	Burglary,	3 years.	Sent Ins. Hosp. Nov.
Eno, Louis,	35	38	Laborer,	Canada,	Putnam,	May	3, 1892,	Assault int. murder,	10 years.	17, 1893; ret. prison
Enright, Thomas,	30	31	Brass polisher,	Connecticut,	Danbury,	May	23, 1894,	Burglary,	2 years.	Sept. 19, 1894.
Eagan, James M.,	22	24	Painter,	Connecticut,	Hartford,	Dec.	6, 1893,	Statutory burglary,	3 years.	
Estrom, Peter,	22	26	Laborer,	Finland,	New Haven,	Oct.	13, 1891,	Manslaughter,	7 years.	
Ewen, William F.,	50	50	Shoemaker,	Ireland,	New Haven,	Jan.	3, 1895	Assault int. rape,	3 years.	
Fanning, Joseph,	28	32	Laborer,	Connecticut,	New Haven,	Oct.	20, 1891,	Theft from person,	7½ yrs.	3d commitment.
Fanning, William,	27	30	Blacksmith,	Connecticut,	New Haven,	Oct.	4, 1892,	Robbery,	4 years.	2d commitment.
Farley, Peter,	23	25	Bartender,	New York,	Hartford,	Sept.	12, 1893,	Theft from person,	4 years.	Farley, *alias* Curtiss.
Farrell, Thomas,	22	22	Hostler,	Colorado,	Hartford,	Mch.	6, 1895,	Statutory burglary,	16 mos.	
Farrell, John,	22	22	Laborer,	Connecticut,	Hartford,	Mch.	5, 1895,	Theft from person,	20 mos.	
Feeney, Martin,	37	45	Rubber cutter,	Vermont,	Waterbury,	Nov.	1, 1887,	Murder, 2d degree,	Life.	
Ferrari, Vettoria,	26	28	Laborer,	Italy,	New Haven,	Sept.	19, 1893,	Pass. c'tfeit money,	7 years.	$1 fine, sent. U.S. Dist. Ct.
Ferri, Pasquali,	29	29	Stone sculptor,	Italy,	Hartford,	Dec.	7, 1894,	Pass. c'tfeit mouey,	5 years.	Sent. U. S. Dist. Ct.
Ferranini, Salvator,	20	20	Laborer,	Italy,	Waterbury,	June	18, 1895,	As. int. co. sodomy,	1½ yrs.	*Alias* Jno. Ballisti.
Fisk, George,	29	31	Pressman,	Connecticut,	Hartford,	June	8, 1893,	Assault int. to kill,	14 years.	
Fitzgerald, Michael,	22	23	Buffer,	Connecticut,	Waterbury,	Feb.	20, 1894,	Burglary,	4 years.	
Finklestein, Jacob,	23	24	Expressman,	New York,	Hartford,	Mch.	13, 1894,	Horse stealing,	6 years.	
Fitzgerald, John,	29	29	Laborer,	Ireland,	Norwich,	May	21, 1895,	Theft,	1 year,	3d offence.
Fosbug, Frank,	28	28	Laborer,	Sweden,	Bridgeport,	Sept.	13, 1895,	Theft,	1½ yrs.	

ROSTER OF CONVICTS CONFINED IN CONNECTICUT STATE PRISON, SEPTEMBER 30, 1894.—*Continued.*

NAME.	Age when committed.	Present Age.	Occupation.	Nativity.	Where convicted.	When committed.	Crime.	Sentence.	Remarks.
Freeman, Amos,	33	35	Painter,	Connecticut,	New Haven,	Jan. 3, 1893,	Burglary,	4 years.	Negro.
Freeman, George,	30	32	Hatter,	Connecticut,	Hartford,	Mch. 7, 1893,	Theft,	3 years.	2d commitment. Negro.
Freeman, Alonzo,	34	45	Teamster,	Virginia,	Litchfield,	April 9, 1884,	Attempted rape,	20 years.	Negro; sent to Ins. Hosp. July 15, '93; ret. Nov. 17, 1893; *alias* Alonzo Johnson; 2d com.
Frost, Henry,	45	46	Farmer,	Denmark,	Tolland,	June 5, 1894,	Theft,	3 years.	
Francis, J. Allen,	61	62	Bank teller.	Connecticut,	Hartford,	Dec. 4, 1894,	Embezzlement,	2 years.	
Fuller, Clifford,	18	21	Farmer,	Connecticut,	Haddam,	Sept. 27, 1892,	Robbery,	7 years.	
Furtmiller, Albert,	22	23	Baker,	Germany,	New Haven,	April 3, 1894,	Theft,	2 years.	
Gaynuch, Anauci,	34	35	Fruit dealer,	Italy,	Danbury,	May 10, 1894,	Pass. c'terfeit coin,	2 years.	
Gay, William,	22	22	Farmer,	Connecticut,	Norwich,	Jan. 23, 1895,	Burglary,	1¾ yrs.	
Garto, Samuel,	28	28	Barber,	Italy,	Hartford,	June 6, 1895,	Willful burn. prop.,	8 years.	
Gilbert, Charles E.,	25	55	Printer,	Connecticut,	Hartford,	May 4, 1865,	Murder, 2d degree,	Life.	Esc'd Oct. 26, '68; recapt'ed May 1, '69; sent to Ins. Hosp. Sept. 10, '74; re'd to pris. Oct. 17, '74.
Gillis, Stephen,	22	23	Teamster,	Canada,	New Haven,	Oct. 16, 1894,	Perjury,	18 mos.	
Glines, Charles,	22	22	Hostler,	Kansas,	Bridgeport,	Feb. 20, 1895,	Robbery,	4 years.	
Gong, Charles,	19	23	Laundryman,	China,	Hartford,	Sept. 9, 1891,	Murder, 2d degree,	Life.	*Alias* Chas. Lee Coon and Lee Yeon Goon.
Gorman, Martin,	31	33	Laborer,	Connecticut,	Hartford.	Dec. 12, 1893,	Statutory burglary,	3 years.	3d commitment.
Goldsborough, R. H.,	25	26	Laborer,	Connecticut,	New Haven,	Oct. 2, 1894,	Rape,	10 years.	
Gordon, James,	24	24	Fireman,	Mass.	Bridgeport,	Sept. 11, 1895,	Burglary,	1 year.	
Graves, Oscar,	18	40	Carri'ge painter,	Connecticut,	Hartford,	Sept. 23, 1873,	Murder, 2d degree,	Life.	Escaped June 27, '87; ret. June 28, 1887.
Green, Charles,	25	30	Carpet layer,	New York,	Bridgeport,	Feb. 25, 1890,	Rape,	15 years.	Negro.
Graham, Lawrence P.,	19	21	Actor,	D. C.	Putnam,	Sept. 5, 1893,	Forgery,	2½ yrs.	2 indictments, 1, 1½.
Green, Hiram,	43	45	Carpenter,	Connecticut,	New Haven,	Sept. 19, 1893,	Burglary,	5 years.	U. S. prisoner.
Grey, Lewis,	23	25	Farmer,	Connecticut,	New Haven,	Oct. 3, 1893,	Horse stealing,	4 years.	2 indictments, 2, 2.
Graham, John,	23	25	Shoemaker,	Maine,	Hartford,	Dec. 5, 1893,	Statutory burglary,	3½ yrs.	
Gray, Charles H.,	21	21	Hostler,	Mass.	Bridgeport,	Feb. 20, 1895,	Burglary,	15 mos.	
Grossman, Marcus,	54	54	Glazier,	Roumània,	New London,	Sept. 3, 1895,	Theft,	18 mos.	
Grice, William,	30	30	Cook,	M. D.,	Haddam,	Sept. 25, 1895,	Horse theft,	4⅔ yrs.	
Hawley, John,	30	57	Laborer,	Connecticut,	Danbury,	Oct. 21, 1868,	Rape,	Life,	Negro.
Hall, Frederick,	32	56	Laborer,	Mass.,	Litchfield,	July 19, 1871,	Murder, 2d degree,	Life.	Negro; sent. to hang; commu. by G. A.
Hayes, Daniel,	22	29	Laborer,	New York,	Hartford,	Sept. 19, 1888,	Rape,	15 years.	

Hanley, James,	26	29	Laborer,	Connecticut,	Litchfield,	May	12, 1892,	Murder; 2d degree,	Life.	Negro; recom. June 9, 1893, for life.
Hawley, John (2),	39	42	Janitor,	Connecticut,	Bridgeport,	Oct.	7, 1892,	Murder, 2d degree,	Life.	
Harney, Michael,	30	32	Laborer,	Connecticut,	New Haven.	April	14, 1893,	Arson,	4 years.	
Hart, Thomas,	24	26	Tailor,	Mass.,	New Haven,	July	5, 1893,	Burglary,	5 years.	
Hall, Thomas,	66	38	Hatter,	Connecticut,	Bridgeport,	Sept.	12, 1893,	Robbery,	4 years.	
Hawley, Florence,	32	36	Housewife,	Connecticut,	Bridgeport,	Mch.	22, 1891,	Manslaughter,	9 years.	Negro; $1 fine.
Hayden, George,	38	39	Carpenter,	Connecticut,	New Haven,	July	6, 1894,	Statutory burglary,	2½ yrs.	
Harwood, Frank,	30	31	Cook,	New York,	Putnam,	Sept.	12, 1894,	Burglary,	3 years.	Negro.
Hasty, John,	31	31	Laborer,	England,	New Haven,	Jan.	2, 1895,	Theft from person,	1 year.	Said sentence to commence at expiration of a prior sentence expiri'g Jan. 19,'95.
Haight, Arthur,	32	32	Bookkeeper,	England,	Hartford,	Mch.	5, 1895,	Forgery,	18 mos,	
Hall, John,	22	22	Laborer,	New York,	Bridgeport,	Sept.	13, 1895,	Indecent assault,	5 years.	
Hewlett, Francis R.,	20	21	Farmer,	Connecticut,	New London,	Jan.	17, 1894,	Rape,	4 years.	
Hewlett, Henry A.,	19	20	Farmer,	Connecticut,	New London,	Jan.	17, 1894,	Rape,	4 years.	
Henry, William,	23	24	Sawyer,	Connecticut,	Bridgeport,	Mch.	2, 1894,	Burglary,	15 years.	
Hennessey, Michael,	39	40	Teamster,	Ireland,	Hartford,	Sept.	11, 1894.	Theft from person,	18 mos.	
Healey, Thomas,	38	38	Mason,	Connecticut,	New Haven,	April	3, 1895,	Assault int. to rob,	3 years.	4th commitment.
Hennessey, Hugh,	23	24	Slater,	Mass.,	Hartford,	Dec.	4. 1894,	Theft from person,	2 years.	
Hine, James A.,	36	39	Farmer,	Connecticut,	New Haven,	Jan.	15, 1892,	Manslaughter,	7 years.	
Hill, Joseph,	34	35	Dyer,	Germany,	Hartford,	Sept.	13, 1894,	Theft,	4 years.	
Hitchcock, Frank,	38	39	Plasterer,	New York,	Hartford,	Dec.	4, 1894,	Horse stealing,	4 years.	
Higgins, Daniel E.,	19	19	Machinist,	Connecticut,	Norwich,	Jan.	15, 1895,	Breaking and enter.,	1½ yrs.	
Higgins, John,	21	21	Steam fitter,	Connecticut,	Bridgeport,	Sept.	11, 1895,	Burglary,	3 years.	2d commitment.
Hingst, Otto,	32	32	Physician,	Germany,	Bridgeport,	Sept.	12, 1895,	Bigamy,	3½ yrs.	
Holloway, Ezra,	48	49	Carpenter,	Connecticut,	New London,	Jan.	12, 1894,	Theft,	3 years.	2d commitment.
Howard, Charles,	19	20	Laborer,	Connecticut,	Windham,	May	9, 1894,	Burglary,	3 years.	Negro.
Hoyt, Russell B.,	47	48	Hatter,	Connecticut,	Hartford,	Dec.	7, 1894,	Forgery,	8 years.	Sentenced by U. S. Ct.
House, Arthur,	42	42	Veter. Surgeon,	Connecticut,	Tolland,	April	10, 1895,	Burglary.	6 years.	2 indictments, 3, 3.
Holding, Fredk. W.,	26	26	Hostler,	Connecticut,	New Haven,	April	2, 1895,	Statutory burglary,	3 years.	
Hutchinson, Fredk.,	28	31	Farmer,	Nova Scotia,	Hartford,	Dec.	6, 1892,	Horse stealing,	7 years.	2 indictments, 3½, 3½.
Hurley, Patrick,	29	30	Laborer,	Ireland,	New Haven,	July	5, 1894,	Abusing child,	3 years.	
Hubbell, Ira,	42	42	Carpenter,	Connecticut,	Hartford,	Sept.	20, 1895,	Assault, int. Rape,	7 years.	
Jackson, Arthur,	33	38	Laborer,	Mass.,	Hartford,	Sept.	9, 1890,	Assault, int. murder,	12 years.	Negro.
Jamieson, Robert W.,	39	40	Cigar maker,	Connecticut,	New Haven,	Jan.	18, 1894,	Assault, int. kill,	2 years.	
Javah, Aredrear,	19	20	Farmer,	Australia,	Bridgeport,	Mch.	7, 1894,	Arson,	4 years.	
Jackson, Frank,	21	21	Cook,	D. C.,	New Haven,	April	2, 1895,	Burglary,	5 years.	
Jackson, William,	22	22	Waiter,	Mass.,	Hartford,	Sept.	17, 1895,	Theft from person,	2 years.	

ROSTER OF CONVICTS CONFINED IN CONNECTICUT STATE PRISON, SEPTEMBER 30, 1895.—*Continued.*

Name.	Age when committed.	Present age.	Occupation.	Nativity.	Where convicted.	When committed.	Crime.	Sentence.	Remarks.
Jimms, Charles,	19	19	Laborer,	Illinois,	New Haven,	April 2, 1895,	Statutory burglary,	3 years.	*Ali.* Roman Klamvitter.
Jensen, Martin,	24	24	Boatman,	Sweden,	New Haven,	Jan. 2, 1895,	Statutory burglary,	2 years.	*Alias* Geo. A. Minor;
Johnson, William,	54	57	Waiter,	Connecticut,	Haddam,	Sept. 27, 1892,	Statutory burglary,	4 years.	8 com.; 2 ind. 2, 2.
Johnson, George,	28	31	Laborer,	Mass.,	Hartford,	Mch. 9, 1892,	Assault int. to kill,	4 years.	4 yrs. from Aug. 6,'92;
Johnson, Henry,	23	24	Teamster,	Connecticut,	Litchfield,	Oct. 11, 1894,	Burglary in day time,	2½ yrs.	sent Ins. Hosp. Jul.
Jordan, John,	26	26	Farmer,	Connecticut,	Winchester,	June 6, 1895,	Statutory arson,	6 years.	15,'93, ret. Nov. 17,
Johnson, George (2),	19	19	Farmer,	New Jersey,	Bridgeport,	Sept. 11, 1895,	Burglary,	1½ yrs.	'93; 2 com. for as-
Kennedy, John P.,	28	38	Cow herder,	Kansas,	New London,	April 2, 1885,	Murder, 2d degree,	Life.	sault. Officer Jones.
Kendrich, Philip,	23	25	Jack spinner,	Connecticut,	Bridgeport,	Feb. 21, 1893,	Assault, attem. rape,	7½ yrs.	
Keegan, Dennis,	25	27	Stove polisher,	R. Island,	New London,	May 12, 1893,	Statutory burglary,	3 years.	
Keena, John,	27	29	Butcher,	Connecticut,	New Haven,	Oct. 24, 1893,	Arson,	8 years.	
Kelly, William,	28	30	Brakeman,	Pa.,	Hartford,	Dec. 5, 1893,	Theft & sta. burg.	3½ yrs.	
Kirwin, James,	22	24	Laborer,	Connecticut,	Hartford,	Dec. 6, 1893,	Statutory burglary,	3 years.	
Keefe, Richard,	34	34	Laborer,	Connecticut,	Norwich,	Jan. 16, 1895,	Attempt com. rape,	4½ yrs.	
Kennedy, Edward,	25	25	Shoemaker.	Connecticut,	Middletown,	April 3, 1895,	Horse theft,	5 years.	
King, William,	33	48	Baker,	Connecticut,	Haddam,	Nov. 10, 1880,	Rape,	25 years.	*Alias* Chas. Williams,
Knapp, Everett,	25	25	Laborer,	Connecticut,	Danbury,	May 16, 1895,	Burglary,	18 mos.	James Judd; 3 com.
Lapham, Alfred W.,	18	21	Stenographer,	New York,	New Haven,	April 5, 1892,	Robbery with viol'ce,	7 years.	
LaFreniere, Louis,	35	36	Cigar maker,	Canada,	New Haven,	Jan. 4, 1894,	Manslaughter,	10 years.	
Ladhoff, John H.,	34	35	Watch maker,	Germany,	Hartford,	Sept. 12, 1894,	Theft,	2 years.	
Lawlor, John,	17	17	Laborer,	Connecticut,	New Haven,	April 3, 1895,	Statutory burglary,	2 years.	
Lennix, Felix,	63	67	Farmer,	Russia,	Hartford,	Mch. 17, 1891,	Sta. burg. & sta. ars.	7 years.	*Alias* Alenipoff; 2 ind.
Leary, James,	32	33	Polisher,	Ohio,	Waterbury,	Feb. 21, 1894,	Highway robbery,	4 years.	3, 4.
Lebutt, Charles,	36	37	Peddler,	Russia,	Hartford,	Mch. 13, 1894,	Horse stealing,	6 years.	
Leader, James,	23	24	Laborer,	Maine,	Killingly,	May 3, 1894,	Rape,	12 years.	
Lee, Henry,	24	25	Painter,	Connecticut,	Hartford,	Dec. 4, 1894,	Horse stealing,	3 years.	
Leonard, Hiram,	63	63	Wood marker,	Connecticut,	Danbury,	May 15, 1895,	Burglary,	2 years.	2 indictments, 1, 1.
Little, William,	31	32	Painter,	New York,	Hartford,	Sept. 13, 1894,	Theft from person,	3 years.	
Loveland, Otis,	25	28	Blacksmith,	New York,	Danbury,	May 12, 1892,	Burglary,	4 years.	

Lock, Ezra M.,	35	36	Farmer,	New York,	New London,	Sept.	4, 1894,	Theft,	2 years.	
Long, Charles,	27	27	Plaste'r & nurse,	New York,	New Haven,	April	9, 1895,	Burglary. 2 counts,	10 years.	
Lobloskey, Anthony,	23	23	Carpenter,	Russia.	Bridgeport,	Sept.	11, 1895,	Burglary. 2 counts,	5 years.	One sent. to take eff. at exp. of the other.
Luddington, Henry,	38	42	Hatter,	Connecticut,	Bridgeport,	May	28, 1891,	Burglary,	8 years.	
Lynch, Patrick,	38	56	Laborer,	Ireland,	New Haven,	Oct.	26, 1877,	Murder, 2d degree,	Life.	
Lynes, John,	23	26	Die sinker,	New York,	New Haven,	Oct.	4, 1892,	Horse stealing,	5 years.	
Mackey, John,	34	45	Machinist,	Ireland,	Bridgeport,	Feb.	21, 1884,	As. int. kill & burg.,	35 years.	2 com. 3 ind. 15, 10, 10.
Mackey, Lawrence,	27	38	Farmer,	Ireland,	Bridgeport,	Feb.	21, 1884,	As. int. kill & burg.,	35 years.	2 com. 3 ind. 15, 10, 10.
Martin, John,	18	20	Farmer,	Mass.,	New Haven,	July	5, 1893,	Burglary,	3 years.	
Mace, Frank,	29	30	Laborer,	New York,	Hartford,	June	12, 1894,	Assault, int. to kill,	12 years.	
Maltby, George E.,	22	23	Clerk,	Virginia,	Danbury,	Oct.	17, 1894,	Horse theft,	2 years.	
Maguire, James,	58	58	Proofreader,	New York.	New Haven,	Mch.	22, 1895,	Counterfeiting,	10 years.	U. S. Court.
Mallin, James H.,	26	26	Steam fitter,	Connecticut,	Bridgeport,	Sept.	11, 1895,	Assault int. to kill,	4 years.	
Mason, Edward,	22	22	Coach-builder,	New York,	Bridgeport,	Sept.	11, 1895,	Horse theft,	2 years.	
Martin, James,	38	38	Shoecutter,	New York,	Hartford,	Sept.	19, 1895,	Statutory burglary,	3 years.	
Metzger, George,	21	21	Plumber,	Connecticut,	Hartford,	Mch.	6, 1895,	Statutory burglary,	16 mos.	
Merrett, Hanford,	20	20	Farmer,	Connecticut,	Danbury,	May	16, 1895,	Statutory burglary,	18 mos.	Negro.
Milo, Napoleon,	22	26	Farmer,	Vermont,	Haddam,	Sept.	23, 1891,	Assault: int. rape,	5 years.	
Mills, Patrick,	24	25	Teamster,	Ireland,	Hartford,	Dec.	5, 1894,	Statutory burglary,	1 year.	
Montario, Manuel,	53	65	Sailor,	Portugal,	Norwich,	Nov.	15, 1883,	Assault, int. murder,	20 years.	2d count.
Moran, James,	28	31	Laborer,	Ireland,	New Haven,	Jan.	5, 1892,	Burglary,	5 years.	
Moulton, John G.,	30	33	Writing master,	Africa,	Hartford,	Sept.	13, 1892,	Horse stealing,	5 years.	
Morrisey, David,	19	20	Driver,	Connecticut,	Hartford,	June	13, 1894,	Statutory burglary,	2 years.	
Morgan, George,	21	21	Railroad man,	New York,	Bridgeport,	Feb.	20, 1895,	Theft from person,	1 year.	
Moran, Matthew,	19	19	Laborer,	Connecticut,	Bridgeport,	Sept.	11, 1895,	Burglary,	1½ yrs.	
Murphy, Michael,	28	31	Hostler,	Connecticut,	New Haven,	Oct.	18, 1892,	Robbery,	4 years.	2d count.
Murphy, Mark,	31	32	Brass finisher,	New York,	Hartford,	Sept.	12, 1894,	Forgery,	12 years.	*Alias* Mark Riley.
Murphy, Lawrence,	25	25	Hostler.	Virginia,	Hartford,	Mch.	6, 1895,	Theft,	3 years.	2d commitment,
McCarthy, Dennis,	21	23	Painter,	Connecticut.	New Haven,	April	13, 1893,	Statutory burglary,	3 years.	
McCrohan, Bartholo.,	25	26	Railroad man,	New Jersey,	Norwich,	May	17, 1894,	Highway robbery,	7 years.	
McCarty, Daniel,	33	33	Brakeman,	Connecticut,	Hartford,	Mch.	5, 1895,	Burglary,	5 years.	*Alias* James Burke.
McCarty, John,	34	34	Granite cutter,	Connecticut,	Danbury,	May	18, 1895,	Burglary,	1 year.	
McCabe, Hugh J.,	25	25	Weaver,	Connecticut,	New Haven,	July	10, 1895,	Statutory burglary,	1½ yrs.	
McClosky, William,	39	39	Rubber worker,	Canada,	Bridgeport,	Sept.	18, 1895,	Robbery,	5 years.	
McDonnell, Charles,	23	25	Waiter,	Connecticut,	Hartford,	Dec.	6, 1893,	Statutory burglary,	3 years.	
McDonald, Robt. L.,	32	33	Clothing cutter,	New York,	New Haven,	Oct.	3, 1894,	Statutory burglary,	2 years.	*Alias* Robt. Desmond.

ROSTER OF CONVICTS CONFINED IN CONNECTICUT STATE PRISON, SEPTEMBER 30, 1895.—*Continued.*

Name.	Age when committed.	Present Age.	Occupation.	Nativity.	Where convicted.	When committed.	Crime.	Sentence.	Remarks.
McDermott, John,	48	48	Laborer,	Ireland,	Tolland,	April 9, 1895,	Being tramp,	9 mos.	
McGrath, John,	24	26	Farmer,	Connecticut,	Norwich,	Jan. 26, 1893,	Burning a barn,	3½ yrs.	
McGuire, George,	36	38	Farmer,	Connecticut,	New Haven,	April 11, 1893,	Rape,	3 years.	
McGowan, Michael,	31	31	Engineer,	R. Island,	Norwich,	Feb. 11, 1895,	Manslaughter,	9½ yrs.	$1 fine.
McKay, Geo. H..	28	28	Baker,	Ireland,	New Haven,	April 18, 1895,	Assault, int. Rape,	3½ yrs.	
McKnight, William,	24	24	Plasterer,	Pa.	Hartford,	June 4, 1895,	Statutory burglary,	2 years.	
McManus, Thomas,	29	29	Coachman,	Ireland,	New Haven,	Jan. 2, 1895,	Theft from person,	1 year.	
McNelson, Daniel G.,	21	21	Laborer,	Kentucky,	New Haven,	April 5, 1895,	Asslt. int. rape child,	3 years,	
Nearing, Frank H.,	24	30	Railroad hand,	Connecticut,	Litchfield,	Oct. 11, 1889,	Rape,	12 years.	
Nelson, William,	22	23	Hostler,	Germany,	Danbury,	May 9, 1894,	Burglary,	2 years.	
Nicholas, Willie,	22	22	Engineer,	Virginia,	Haddam,	Sept. 25, 1895,	Horse theft,	4⅔ yrs.	
Nowlin, John,	39	42	Milk peddler.	New York,	Hartford,	June 7, 1892,	Assault,	12 years.	$500.00 fine. Sent to Ins. Hosp. Nov. 17, 1893, ret. to prison Sept. 19, 1894.
Nolan, Francis,	34	36	Cook,	Ireland,	Hartford,	Sept. 12, 1893,	Theft from person,.	4 years.	
Nolan, Timothy,	27	28	Miller,	England,	Hartford,	Mch. 6, 1894,	Statutory burglary,	3 years.	
Nyman, John,	27	35	Laborer,	Germany,	Tolland,	Sept. 6, 1887,	Manslaughter,	8½ yrs.	
Nudic, Jacob,	47	51	Farmer,	Russia,	Hartford,	Mch. 17, 1891,	statu. arson, burg.,	7 years.	
Oakes, Joel W.,	59	60	Carpenter,	Mass.	Litchfield,	Nov. 13, 1894,	Forgery,	5 years.	*Alias* Fr'klin Thompson,
O'Brien, William,	23	23	Plasterer,	New York,	New Haven,	Jan. 8, 1895,	Statutory burglary,	2 years.	
O'Brien, Frank,	31	31	Laborer,	Wales,	New Haven,	April 29, 1895,	Being a tramp,	8 mos.	
O'Connor, Daniel.	22	23	Rubber maker,	New York,	Waterbury,	Feb. 22, 1894,	Attempt at rape,	9 years.	
O'Donnell, Jerry,	23	24	Buffer,	Connecticut,	Waterbury,	Feb. 20, 1894,	Burglary,	3 years.	
Oliver, Henry,	48	48	Cook,	Pa.	New Haven,	Mch. 22, 1895,	Counterfeiting,	8 years.	U. S. Court.
O'Mara, John S.,	36	36	Farmer,	Ireland,	Bridgeport,	Sept. 10, 1895,	Assault int. to kill,	5 years.	
O'Neil, Eugene,	23	23	Laborer,	Connecticut,	New Haven,	April 2, 1895,	Statutory burglary,	2 years.	
O'Neil, John,	33	33	Painter,	Connecticut,	Bridgeport,	Sept. 11, 1895,	Burglary,	3 years.	3d commitment.
Parker, Samuel,	29	32	Hostler,	D. C.,	Hartford,	Sept. 13, 1892,	Theft from person,	4 years.	Negro; formerly as Geo. Parker. 2 com.
Patrick, Charles,	36	38	Painter,	New York,	Bridgeport,	Sept. 29, 1893,	Burglary,	2 5-12 ys.	
Patrick, William,	32	33	Farmer,	Connecticut,	Danbury,	May 8, 1894,	Attempt at rape,	5 years.	
Perkins, Joel W.,	54	78	Carpenter,	Connecticut,	Litchfield,	April 28, 1871,	Murder, 2d degree,	Life.	

Peaceclay, Daniel,	34	36	Farmer,	Connecticut,	New Haven,	Oct.	13, 1893,	Assault int. to kill,	5 years.	Formerly committed under name Ewd. R. Perkins. 2 commit.
Perry, William,	33	33	Farmer,	Connecticut,	Norwich,	Jan.	10, 1895,	Breaking and enter.,	1½ yrs.	
Perkins, Raymond,	43	43	Carpenter,	Connecticut,	Hartford,	Sept.	17, 1895,	Horse stealing,	10 years.	
Pine, Samuel,	24	33	Hatter,	Mass.,	Bridgeport,	Feb.	28, 1886,	Burg. & Horse steal.	14 years.	Neg;2in.10,4.*a*R.Brown
Potsmato, Frank,	45	46	Teamster,	Italy,	New Haven,	April	11, 1894,	Assault int. to kill,	5 years.	*Alias* F. Passamento.
Quinn, John,	18	22	Mill hand,	Connecticut,	Tolland,	Sept.	1, 1891,	At. rape & br. jail,	13 years.	2 com. sent Ins. Hosp. July 15, '93, ret. to prison, June 8, '95.
Quigley, Thomas,	28	30	Carriage maker,	Connecticut,	Hartford,	Mch.	8, 1893,	Theft,	3½ yrs.	
Qesky, John,	33	33	Engineer,	Poland,	New Haven,	April	11, 1895,	Ob. money fa. pret.,	2 years.	
Rathburn, Chas. I.,	36	39	Farmer,	Connecticut,	New London,	Sept.	16, 1892,	Murder, 2d degree,	Life.	
Randall, William,	25	27	Laborer,	Connecticut,	Bridgeport,	Feb.	21, 1893,	Burglary,	4 years.	
Ray, Frank,	24	25	Bridge builder,	Illinois,	Winchester,	Dec.	4, 1894,	Burglary,	3½ yrs.	
Ray, George,	26	27	Shoemaker,	Illinois,	Winchester,	Dec.	4, 1894,	Burglary,	3½ yrs.	
Richwald, Helena,	24	27	House girl,	Germany,	New London,	Sept.	16, 1892,	Manslaughter,	4 years.	$1 fine.
Reardon, Patrick,	39	41	Laborer,	Ireland,	New Haven,	Oct.	5, 1893,	Theft,	3 years.	3d offence; committed formerly under Jno. Salboon. 2d com't.
Reynolds, James,	21	22	Buffer,	Connecticut,	Waterbury,	Feb.	20, 1894,	Burglary,	2 years.	
Reicciardella, Mauro,	53	54	Laborer,	Italy,	New Haven,	July,	5, 1894,	Abus. fem. child,	3 years.	
Reynolds, William,	28	28	Farmer,	Connecticut,	Hartford,	June	4, 1895,	Statutory burglary,	2 years.	
Reynold, Frank H.,	34	34	Shirt ironer,	Connecticut,	New Haven,	July	3, 1895,	Theft from person,	1 year.	2d commitment.
Rinardo, Joseph,	26	27	Laborer,	Italy,	New Haven,	Jan.	19, 1894,	Assault, int. murder,	10 years.	
Riley, John,	26	27	Stone cutter,	Africa,	Litchfield,	Oct.	9, 1894,	Escaped from jail,	18 mos.	
Riley Terence,	23	23	Metal polisher,	Connecticut,	Hartford,	May	5, 1895,	Theft from person,	20 mos.	
Robinson, Chas. S.,	24	27	Florist,	Ireland,	Hartford,	Sept.	14, 1892,	Horse stealing,	7 years.	
Rossi, Giacomo,	19	20	Shoemaker,	Italy,	New Haven,	Jan.	17, 1894,	Manslaughter,	3 years.	
Rohan, Edward,	35	36	Laborer,	R. Island,	Tolland,	April	20, 1894,	Burglary, 4 counts,	5 years.	
Rome, Samuel W.,	46	48	Carpenter,	Canada,	Danbury,	Oct.	24, 1893,	Arson,	8 years.	
Ross, John,	40	41	Cook,	Mass.,	Hartford,	Sept.	12, 1894,	Horse stealing,	3½ yrs.	Negro.
Rookey, Joshua,	34	34	Carpenter,	New York,	Bridgeport,	Feb.	28, 1895,	Attempt at rape,	5 years.	
Root, Frederick,	22	22	Cook,	New York,	New Haven,	July	3, 1895,	Statutory burglary,	1 year.	
Rogers, John H.,	23	23	Waiter,	England,	Bridgeport,	Sept.	10, 1895,	Burglary,	5 years.	*Alias* Frank Aiken & Frank Atkins.
Rugton, W. J.,	46	46	Carpenter,	Colorado,	New Haven,	Jan.	4, 1895,	Horse stealing,	5 years.	
Ryan, James,	22	26	Peddler,	New York,	Middletown,	April	7, 1891,	Burglary,	7½ yrs.	2 ind., 5 and 2½.
Ryan, William, No. 3,	28	29	Railroad man,	Connecticut,	Hartford,	Mch.	7, 1894,	Statutory burglary,	2½ yrs.	2d commitment.
Ryams, John,	32	33	Moulder,	New York,	Danbury,	May	9, 1894,	Horse theft, burg.,	4 years.	4th commitment.
Ryan, John,	22	22	Brakeman,	New York,	Bridgeport,	Feb.	20, 1895,	Theft from person,	1 year.	
Saunders, James,	24	25	Machinist,	New York,	Litchfield,	Oct.	9, 1894,	Escaped from jail,	18 mos.	*Alias* W. White.
Savage, Meerty,	54	54	Printer,	Connecticut,	Bridgeport,	Feb.	20, 1895,	Horse theft,	3 years.	3d commitment.

ROSTER OF CONVICTS CONFINED IN CONNECTICUT STATE PRISON, SEPTEMBER 30, 1895.—*Continued.*

NAME.	Age when committed.	Present Age.	Occupation.	Nativity.	Where convicted.	When committed.	Crime.	Sentence.	Remarks.
Sargent, Walter,	49	49	Painter,	Maine,	Bridgeport,	Sept. 11, 1895,	Burglary,	1 year.	
Scholly, David,	35	35	Farmer,	Connecticut,	Tolland,	Dec. 5, 1894,	Rape,	20 years.	
Scaplin, William,	21	21	Carpenter,	New York,	Norwich,	Jan. 2, 1895,	Burglary,	1 year.	
Short, Alberto,	45	48	Laborer,	Italy,	New Haven,	Oct. 20, 1892,	Passing c'terf't coin,	4 years.	U. S. Court.
Shelton, Mark R.,	25	27	Buffer,	D. C.,	New Haven,	Jan. 3, 1893,	Burglary,	4 years.	Sent. In. Hos. Dec. 12, '94, ret. Mar. 5, '95.
Shea, Charles,	41	43	Porter,	New York,	New London,	Sept. 5, 1893,	Statutory burglary,	3 years.	
Simonds, George,	31	32	Laster,	New York,	Danbury,	June 23, 1894,	Burglary,	4 years.	2d commitment.
Smith, Amos,	31	40	Stone mason,	Connecticut,	Litchfield,	April 14, 1886,	Asst., att. kill child,	18 years.	
Smith, Wm. W.,	19	22	Moulder,	Connecticut,	Haddam.	Sept. 27, 1892,	Robbery,	7 years.	
Smith, Chas. 2nd.,	35	37	Organ maker,	Connecticut,	Windham,	May 2, 1893,	Horse stealing,	4 years.	2 indictments, 2, 2.
Smith, James F.,	28	29	Laborer,	Connecticut,	New Haven,	April 25, 1894,	Robbery,	4½ yrs.	
Smith, Frank,	23	24	Mill hand,	Mass.	Litchfield,	Oct. 11, 1894	Burglary,	2½ yrs.	
Smith, William,	17	17	Laborer,	Connecticut,	Danbury,	May 16, 1895,	Burglary,	3 years.	2 indictments, 2, 1.
Souder, Wm. J.,	26	32	Salesman,	Ohio,	Hartford,	Sept. 28, 1889,	Manslaughter,	7 years.	$1 fine.
Soares, Emanuel,	40	41	Sailor,	Portugal,	New Haven,	July 5, 1894,	Robbery,	4 years.	
Squires, Andrew,	40	50	Farmer,	Connecticut,	Brooklyn,	April 23, 1885,	Murder, 2d degree,	Life.	
Steere, Dwight,	28	47	Bartender,	Mass.,	Norwich,	April 24. 1876,	Murder, 2d degree,	Life.	Sent to Insane Hosp. Nov. 17, 1893, ret. Sept. 19, 1894.
Stoffle, Rudolph,	40	46	Farmer,	Germany,	Bridgeport,	Oct. 18, 1889,	Murder, 2d degree,	Life.	
St. Marie, Arthur,	20	21	Waiter,	Mass.,	Hartford,	June 12, 1894	Assault, int. to kill.	12 years.	
Stevenson, George,	29	30	Railroad man,	Connecticut,	Litchfield,	Oct. 9, 1894,	Escaped from jail,	2 years.	
Stevens, Jas. A.,	37	38	Coachman,	New Jersey,	New Haven,	Oct. 18, 1894,	Assault, int. to kill,	2 years.	
Sullivan, James,	21	22	Tinsmith,	Connecticut,	New Haven,	July 3, 1894,	Burglary,	5 years.	
Sullivan, Cornelius,	51	52	Laborer,	Ireland,	Tolland,	Dec. 6, 1894,	Assault, int. rape,	6 years.	
Sullivan, Jas., No. 2,	27	27	Fireman,	N. B.,	Hartford,	Sept. 18, 1895,	In dw. h. by night,	4 years.	
Taylor, James F.,	20	28	Bartender,	New York,	New Haven,	July 18, 1887,	Murder, 2d degree,	Life.	
Taylor, Edward,	56	56	Laborer,	New York,	Bridgeport,	Feb. 20, 1895,	Burglary,	15 years.	
Tassock, William,	26	26	Laborer,	Connecticut,	Danbury,	May 20, 1895,	Robbery,	6 years.	
Thomas, Norman,	27	31	Sign painter,	New York,	Bridgeport,	Feb. 19, 1891,	Assault, int. murder,	15 years.	
Thompson, Thomas,	36	38	Farmer,	Connecticut,	Litchfield,	Oct. 19, 1893,	Car. abuse of child,	7 years.	Negro.
Thompson, John,	37	38	Laborer,	New York,	Hartford,	Sept. 12, 1894,	Horse stealing,	3 years.	Negro.
Thompson, James H.,	39	39	Painter,	Connecticut,	New Haven,	July 9, 1895,	Horse stealing,	2 years.	5th commitment.

Tinkham, Emma,	21	22	Housekeeper,	Connecticut,	Hartford,	Mch.	15, 1894,	Manslaughter,	2 years.	$1 fi.conf.No.22,'94.boy
Trenk, Edward,	19	19	Barber,	Mass.,	Bridgeport,	Feb.	20, 1895,	Robbery,	4 years.	*Alias* Conrad Trenck.
Tyler, John,	35	37	Sailor,	Africa,	Hartford,	Dec.	6, 1893,	Burg. with pers. vio.	18 years.	Negro.
Veitch, Edward,	23	25	Painter,	Connecticut,	Bridgeport,	Sept.	12, 1893,	Robbery,	4 years.	
Warren, John,	21	57	Farmer,	Connecticut,	Tolland,	Dec.	14, 1859,	Murder, 2d degree,	Life.	
Walker, Edward H.,	22	28	Laborer,	Connecticut,	Bridgeport,	Nov.	6. 1889,	Manslaughter,	10 years.	$1 fine.
Wallack, Geo. A.,	22	27	Boatman,	Michigan,	Bridgeport,	Sept.	12, 1890,	Robbery and theft,	12 years.	
Wallace, Geo. W.,	25	30	Book-keeper,	Illinois,	Bridgeport,	Sept.	12, 1890,	Robbery and theft,	12 years.	
Ward, Charles,	36	38	Upholsterer,	Mass.,	New Haven,	Oct.	6, 1893,	Burglary,	6 years.	*Alias* John Brennan.
Wah, Ken,	50	51	Laundryman,	China,	New Haven,	Jan.	19, 1894,	Assault, int. to kill,	5 years.	
Walcott, William,	23	24	Painter,	Connecticut,	Brooklyn,	May	1, 1894,	Burglary,	3 years.	
Wade, Austin A.,	27	28	Farmer,	Connecticut,	Windham,	Dec.	11, 1894,	Horse stealing,	2 years,	
Walker, Hunter,	41	41	Waiter,	N. C.,	Bridgeport,	Sept.	12, 1895,	Assault, int. to kill,	1 year.	Negro.
Webster, Daniel S.,	20	25	Farmer,	Connecticut,	Waterbury,	April	23, 1890,	Assault, int. to kill,	8 years.	
Welch, James,	32	35	Railroad hand,	New York.	Hartford,	June	6, 1893,	Theft,	3 years.	
Welch, William Jr.,	36	38	Blacksmith,	Connecticut,	New London,	Sept.	8, 1893,	Burning barn,	6 years.	
Weldon, Arthur O.,	22	23	Laborer,	Mass.,	Litchfield,	Oct.	9, 1894,	Theft of bicycle,	1½ yrs.	
Welch, Thos., No. 2,	50	50	Waiter,	Ireland,	Hartford,	June	5, 1895,	Theft from person,	2½ yrs.	2d commitment.
Whelton, John,	26	29	Laborer,	Wales,	Norwich,	May	4, 1892,	Burglary,	4 years.	
Whapples, Martin,	67	69	Farmer,	Connecticut,	Hartford,	Mch.	7, 1893,	Assault, iut. to kill,	4 years.	
Whitefield, George,	27	28	Doctor,	W. I.,	New Haven,	Jan.	30, 1894,	Forgery,	2½ yrs.	
Whipple, Frank A.,	28	29	Laborer,	Connecticut,	New London,	Sept.	13, 1894,	Barn burning,	5 years.	
White, James,	39	39	Blacksmith,	Mass.,	New Haven,	Jan.	2, 1895,	Being a tramp,	10 mos.	
Williams, Geo. W.,	21	28	Farmer,	Connecticut,	Middletown,	Dec.	4, 1888,	Rape,	15 years.	Negro.
Willis, Zyp,	45	48	Laborer,	Virginia,	Bridgeport,	Feb.	24, 1892,	Rape,	Life.	Negro; 2d commitment.
Williams, Geo. B.,	40	42	Farmer,	Mass.,	Hartford,	Sept.	12, 1893,	Horse stealing,	3 years.	
Wilcox, Louis H.,	17	18	Farmer,	Connecticut,	New London,	Jan.	17, 1894,	Carn'l abuse, child,	4 years.	
Winterfield, Wm. A.,	24	25	Laster,	Denmark,	New Haven,	Jan.	4, 1894,	Theft,	2 years.	2d commitment.
Williams, William,	20	21	Shipping Clerk,	New York,	Bridgeport,	Feb.	21, 1894,	Burglary,	2 years.	
Williams, John,	22	23	Laborer,	Connecticut,	Bridgeport,	Sept.	13, 1894,	Burglary,	3 years.	
Wilson, Frederick,	19	20	Waiter,	Ohio,	Hartford,	Dec.	4, 1894,	Statutory burglary,	2 years.	
Wingood, Barton,	18	19	Brass Moulder,	Connecticut,	Middletown,	Dec.	4, 1894,	Burglary,	3 years.	
Williams, Walcott P.,	31	31	Farmer,	Connecticut,	Hartford,	Mch.	5, 1895,	As. int. ra., rob., bur.	14 years.	3 indictments; 5, 4, 5.
Willetto, William,	33	33	Painter,	New York,	Danbury,	May	15, 1895,	Attempt to rape,	7 years.	
Wilson, Fred'k, No. 2	27	27	Steam fitter,	Mass.,	New Haven,	July	2, 1895,	Statutory burglary,	1½ yrs.	
Widengram, Ludwig,	29	29	Sailor,	Sweden,	Bridgeport,	Sept.	13, 1895,	Theft,	1½ yrs.	
Worth, Robert,	52	53	Seaman,	England,	Hartford,	June	5, 1895,	Sta. burn. priv. bdg.	2 years.	
Woodman, Frank E.,	34	35	Clerk,	N. H.,	Litchfield,	Nov.	8, 1894,	Burglary,	1½ yrs.	
Wruck, Chas. F.,	22	22	Locksmith,	Connecticut,	New Haven,	Jan.	8, 1895,	Assault, int. murder,	10 years.	

ROSTER OF CONVICTS DISCHARGED FROM THE CONNECTICUT STATE PRISON FROM OCT. 1, 1894, TO SEPT 30, 1895.

NAME.	Age when committed.	Present age.	Occupation.	Nativity.	Where convicted.	When committed.	Crimes.	Sentence.	When discharged.	Good time lost.	Remarks.
Aldpost, Thomas,	29	31	Sailor,	England,	Bridgeport,	Sept. 13, 1893,	Theft of boat,	1½ years,	Jan. 29, 1895.	33 days.	
Albig, Chas. W.,	32	35	....	Connecticut,	New Haven,	Oct. 25, 1893,	Hav, carn'l kno'l of fem'le child,	6 years,	June 26, 1895.	....	Pardoned by Board of Pardons.
Arnold, William,	18	19	Laundry Asst.,	Rhode Island,	Putnam,	Sept. 5, 1893,	Theft cert. goods,	1½ years,	Dec. 24, 1894.	....	
Ashley, William,	27	28	Engraver,	Connecticut,	New Haven,	April 3, 1894,	Statu. burglary,	1½ years,	July 19, 1895.	....	
Batterson, John, 2nd,	29	31	Farmer,	Connecticut,	Bridgeport,	Feb. 24, 1893,	Arson,	2½ years.	May 4, 1895.	14 days.	
Baldwin, Ernest,	19	21	Farmer,	Connecticut,	Bridgeport,	May 10, 1893,	As'lt, int. to rape,	2 years,	Jan. 29, 1895.	....	Negro.
Boleam, Frank,	21	23	Brakeman,	Connecticut,	New London,	Sept. 15, 1893,	Burglary,	1½ years,	Jan. 3, 1895.	5 days.	
Banks, Edward,	40	41	Farmer,	Virginia,	Bridgeport,	Sept. 13, 1894.	As'lt, int. to rape,	1 year,	Sept. 12, 1895.	50 days.	Negro.
Barnes, John,	24	25	Printer,	New York,	New Haven,	Oct. 3, 1894,	Theft from person,	1 year,	Aug. 18, 1895.	5 days.	
Bell, Peter C.,	57	59	Farmer,	Connecticut,	Hartford,	Dec. 7, 1893,	Statutory arson,	2 years,	Aug. 28, 1895.	....	
Bloeser, John W.,	26	34	Barber,	Pennsylvania,	Norwich,	Jan. 5, 1887,	Arson,	10 years,	Aug. 8, 1895.	....	
Bloeser, Henry J.,	47	55	Upholsterer,	Germany,	Norwich,	Jan. 5, 1887,	Arson,	10 years,	Aug. 8, 1895.	....	
Brooks, Harry W.,	18	21	Shipping clerk,	Connecticut,	New Haven,	Oct. 20, 1892,	Burglary,	3 years,	June 1, 1895.	10 days.	
Breen, John,	19	20	Shirt maker,	Massachu'tts,	Bridgeport,	Sept. 15, 1893,	Burglary,	1½ years,	Jan. 3, 1895.	5 days.	Sent to Ins'e Hos. Apr. 13, '94; r't'nd to pris. Sept. 19, '94; sent to Ins'e Hos. ag'n Dec. 12, '94; returned March 5, '95.
Brick, Louisa,	25	26	Housewife,	Connecticut,	Waterbury,	Feb. 21, 1894.	Adultery,	1 year,	Jan. 5, 1895.	4 days.	
Brown, Charles,	25	26	Farmer,	Connecticut,	Hartford,	June 6, 1894.	Cruelty to anim'ls,	1 year,	April 16, 1895.	...	
Burns, John,	26	31	Stamping buckles,	Pennsylvania,	Waterbury,	April 28, 1891,	As'lt, int. to rape,	5 years,	Aug. 31, 1895.	15 days	
Burke, Joseph,	23	25	Shoe cutter,	Germany,	New Haven,	Oct. 4, 1893.	Forgery,	2 years,	June 27, 1895.	2 days.	
Butler, John,	25	27	Farmer,	Connecticut,	New London,	Jan. 2, 1894,	Theft from person,	2 years,	Sept. 23, 1895.	....	2d commitment.

Casey, Thomas, No. 2,	21	24	Box maker,	Louisiana,	Hartford,	June 7, 1892,	Statu. burglary,	3 years,	Jan. 7, 1895.	...	2 Ind. 1½ and 1½.
Carlin, Charles,	18	19	Waiter,	Connecticut,	New Haven,	April 29, 1894,	Statu. burglary,	1½ years,	Sept. 2, 1895.	20 days.	Del. to Dep. Sher. Wilson, on papers from Mass A'thor.
Carrol, James, No. 2,	29	30	Laborer,	Connecticut,	New Haven,	April 3, 1894,	Statu. burglary,	1½ years,	July 24, 1895.	5 days.	Belongs Charleston tribe of Indians
Charcoit, Clinton,	17	18	Grinder,	Connecticut,	Putnam,	Sept. 5, 1893,	Theft cert. goods,	1½ years,	Jan. 18, 1895.	30 days.	
Chubb, Walter,	27	27	Papermaker,	New York,	New Haven,	April 3, 1895,	Being a tramp,	2 mos.,	June 2, 1895.	....	
Coleman, James,	32	34	Gardener,	Ireland,	Norwich,	Jan. 3, 1893,	Burglary,	2½ years,	Feb. 27, 1895.	....	
Connors, Patrick,	19	21	Polisher,	New York,	New Haven,	April 4, 1893,	Statu. burglary,	2 years,	Dec. 24, 1895.	....	
Coffey, Michael,	26	28	Laborer,	Connecticut,	New Haven,	April 19, 1893,	Statu. burglary,	2 years,	Jan. 13, 1895.	5 days.	
Cook, Edwin M.,	33	35	Shoemaker,	Connecticut,	Litchfield,	Oct. 13, 1893,	Incest,	2 years,	July 4, 1895.	....	
Convery, James,	22	23	Laborer,	Connecticut,	Bridgeport,	Feb. 28, 1894,	Burglary,	1 year,	Jan. 8, 1895.	....	
Crossley, Floyde,	33	36	Wood chopper,	Connecticut,	Litchfield,	May 12, 1892,	Manslaughter,	3 years,	June 30, 1895.	....	Negro; $100 fine worked out.
Cunningham, John,	33	34	Iron moulder,	Connecticut,	New Haven,	Jan. 24, 1894,	Statu. burglary,	1½ years,	May 9, 1895.	....	
Cunningham, Stephen,	26	27	Laborer,	Connecticut,	New Haven,	Feb. 2, 1894,	Theft from person,	1¼ years,	Mar. 12, 1895.	....	
Daley, Patrick Jr.,	20	21	Buffer,	Connecticut,	New Haven,	Jan. 4, 1894,	Statu. burglary,	1 year,	Nov. 14, 1894.	...	
Davis, Peter,	25	26	Laborer,	Connecticut,	New Haven,	Jan. 5, 1894,	Theft,	1½ years,	April 20, 1895.	....	
Daniels, Charles,	34	35	Mason,	Connecticut,	Norwich,	May 9, 1894,	Burglary,	1½ years,	Aug. 27, 1895.	2 days.	
Daniels, William,	31	32	Blacksmith,	England,	Norwich,	May 9, 1894,	Burglary,	1½ years,	Aug. 25, 1895.	....	
Dimlow, Henry,	24	28	Laborer,	Connecticut,	Hartford,	Dec. 8, 1891,	Statu. Burglary,	4 years,	May 16, 1895.	...	2d commitment.
Diamon, Leonard,	28	30	R. R. man,	Canada,	Putnam,	Dec. 20, 1893,	Burglary,	1 year,	Oct. 30, 1894.	....	
Driggs, Geo. D.,	47	49	Hostler,	Connecticut,	Litchfield,	Oct. 19, 1893,	As'lt, int. to kill,	2 years,	July 10, 1895.	....	2d commitment.
Dunn, Thomas, No. 2,	37	38	Laborer,	Connecticut,	Litchfield,	April 10, 1894,	Burglary,	1½ years,	July 26, 1895.	....	2d commitment.
Fisher, Charles,	22	23	Ship caulker,	Connecticut,	New Haven,	Jan. 24, 1894,	Statu. burglary,	1½ years,	May 9, 1895.	....	Negro.
Fisher, Paul,	25	26	Laborer,	Germany,	Bridgeport,	Oct. 18, 1893,	Forgery,	1 y, 2 mos,	Oct. 18, 1894.	....	
Fitzgerald, Thomas,	28	29	Fireman,	Ireland,	Bridgeport,	Feb. 22, 1894,	Theft from person,	1¼ years,	Mar. 22, 1895.	....	

ROSTER OF CONVICTS DISCHARGED FROM CONN. STATE PRISON FROM OCT. 1, 1894, TO SEPT. 30, 1895.—*Continued.*

NAME.	Age when committed.	Present age.	Occupation.	Nativity.	Where convicted.	When committed.	Crimes.	Sentence.	When discharged.	Good time lost.	Remarks.
Fleetman, Philip,	26	27	Barber,	Germany,	Bridgeport,	Feb. 21, 1894,	Theft,	1 year,	Jan. 11, 1895.	10 days.	
Franklin, Carlo,	25	27	Shoemaker,	Italy,	New Haven,	Jan. 11, 1893.	As'lt, int. to mur.,	2 years,	Oct. 2, 1894.	...	
Gillispie, John,	35	50	Laborer,	Maryland,	Hartford,	Dec. 8, 1881,	Burglary,	15 years,	Nov. 3, 1894.	5 days.	2 indictments, 10, 5.
Green, John,	38	41	Brick mason,	New York,	Danbury,	Nov. 17, 1892,	Burglary,	2½ years,	Jan. 11, 1895.	....	
Guthrie, John,	23	25	Shoemaker,	Ireland,	New Haven,	Jan. 18, 1894,	Statu. burglary,	1½ years,	May 3, 1895.	....	2d commitment
Gtowiski, John,	24	25	Dyer,	Germany,	Tolland,	Apr. 20, 1894,	Forgery,	1¼ years.	May 19, 1895.	....	
Hauerwas, Henry,	30	42	Butcher,	Connecticut,	Tolland,	Sept. 12, 1883,	Burg.& break. jail,	13 years,	Dec. 15, 1894.	30 days.	2 indictments, 10, 3.
Harrington, John,	27	30	Polisher,	Connecticut,	Hartford,	June 7, 1892,	Theft,	3 years,	Jan. 20, 1895	13 days.	2d commitment, 3d offense.
Hanson, Samuel,	19	20	Laborer,	Connecticut,	Hartford,	Dec. 5, 1893,	Statu. burglary,	1 year,	Oct. 15, 1894.	....	
Harrison, Patrick,	24	25	Moulder,	Connecticut,	Bridgeport,	Feb. 21, 1894,	Burglary,	1 year,	Jan. 1, 1895	....	
Haney, William,	38	39	Hostler,	Connecticut,	Waterbury,	Feb. 21, 1894,	Adultery,	1 year,	Jan. 1, 1895.	....	
Hanson, Hans,	18	19	Kitchen hand,	Connecticut,	Hartford,	June 5, 1894,	Statu. burglary,	1 year,	Apr. 20, 1895.	5 days.	
Hannibal, George,	19	20	Teamster,	Connecticut,	Litchfield,	Oct. 9, 1894,	Escaped from jail,	1 year,	Aug. 19, 1895.	...	
Hines, John,	33	35	Barber,	Massachusetts	Hartford	Dec. 7, 1892,	Theft from person,	2½ years,	Feb. 1, 1895.	....	
Higgins, John F.,	19	20	Laborer,	Connecticut,	New Haven,	July 5, 1893,	Statu. burglary,	1½ years,	Oct. 21, 1894.	....	
Hitchcock, Dwight L.,	49	50	Cook,	Connecticut,	New Haven,	Jan. 17, 1894,	Bigamy,	1½ years,	May 2, 1895.	....	
Hoffman, Joseph,	22	24	Brass finisher,	Connecticut,	New Haven,	Oct. 3, 1893,	Statu. burglary,	2 years,	June 24, 1895.	...	
Horton, Edward D.,	26	27	Hatter,	Connecticut,	Bridgeport,	Feb. 22, 1895,	Theft from person,	1 year,	Jan. 2, 1895.	....	
Hyter, Gilbert,	29	34	Laborer,	New York,	Litchfield,	Apr. 21, 1891,	Horse stealing,	5 years,	Aug. 9, 1895.	....	

Ivers, George,	42	44	Engineer,	Connecticut,	Hartford,	Dec. 6, 1892,	Theft from person,	2½ years,	Jan. 31, 1895.	....	
Jaycock, George,	30	34	Farmer,	New York,	Bridgeport,	Sept. 8, 1891,	Horse theft,	4 years,	April 2, 1895.	47 days.	2 indictments, 2, 2. Negro, *alias* Lawrence.
Johnson, Fred D.,	30	32	... .	Connecticut,	Hartford,	Sept. 12, 1893,	Horse stealing,	2 years,	June 3, 1895.	....	
Kane, John,	28	29	Laborer,	Connecticut,	Middletown,	Dec. 4, 1894,	Being a tramp,	6 months,	June 3, 1895.	....	
Keefe, Andrew,	26	29	Merchant,	New York,	New Haven,	Jan. 19, 1893,	Manslaughter,	3 years,	Aug. 26, 1895.	5 days.	
Kinsman, John T.,	48	51	Laborer,	England,	New Haven,	Oct. 4, 1892.	Statu. burglary,	3 years,	May 6, 1895.	....	
Kimball, Frank,	22	24	Machinist,	Connecticut,	Bridgeport,	Sept. 29, 1893,	Burglary,	19 months,	Feb. 6, 1895.	.. .	
Kirke, Patrick,	30	31	Laborer,	Ireland,	Litchfield,	Oct. 9, 1894,	Being a tramp,	6 months,	April 8, 1895.	....	
Kinghorn, John H.,	40	41	Laborer,	Massachusetts	Norwich,	Jan. 3, 1895,	Vag. & b'ng tramp,	8 months,	Sept. 2, 1895.	....	3d commitment; *alias* John King & John H. King.
Lamphere, Jas. M.,	49	53	Painter,	Connecticut,	Middletown,	Apr. 6, 1892,	Robbery,	4 years,	Sept. 13, 1895.	....	
Latham, Charles,	20	23	Laborer,	Connecticut,	New London,	Sept. 27, 1892,	Statu. burglary,	3 years,	Apr. 29, 1895.	....	Deliv. to Jeremiah Dennehy, police sergeant, N. H., on other charges.
Lahman, Herman M.,	20	22	Carpenter,	Connecticut,	New Haven,	Apr. 4, 1893,	Statu. burglary,	2½ years,	June 5, 1895.	5 days.	
Lawler, Michael,	18	20	Buffer,	Connecticut,	New Haven,	Jan. 17, 1894,	Statu. burglary,	1½ years,	May 7, 1895.	5 days.	
Lawler, Melvina,	29	30	Housewife,	Connecticut,	New Haven,	July 5, 1894,	Adultery,	1 year,	May 15, 1895.	....	
Leydon, Robert J.,	54	59	Blacksmith,	Ireland,	Hartford,	Dec. 2, 1890,	As'lt, int. to rape,	5 years,	Mar. 21, 1895.	....	
Leighton, William,	25	28	Waiter,	Connecticut,	Hartford,	Dec. 7, 1892,	Theft from person,	2½ years,	Feb. 1, 1895.	....	Negro.
Lennon, Michael,	23	25	Farmer,	Connecticut,	New Haven,	July 19, 1893,	Statu. burglary,	2 years,	April 9, 1895.	....	
Leary, Daniel,	24	29	Farmer,	Connecticut,	New Haven,	Oct. 7, 1890,	Horse stealing,	5 years,	Jan. 24, 1895.	....	
Leary, Arthur,	35	37	Laborer,	Connecticut,	Norwich,	May 17, 1894,	Theft,	18 months,	Sept. 2, 1895.	....	
Leban, Joseph,	30	31	Laborer,	France,	Hartford,	Sept. 12, 1894,	Theft from person,	1 year,	July 23, 1895.	....	
Lennehan, Joseph,	24	25	Fireman,	Indiana,	Litchfield,	Oct. 9, 1894,	Theft,	1 year,	Aug. 24, 1895.	5 days.	
Lincoln, William,	18	20	Telegraph Oper.,	Massachusetts	New Haven,	Apr. 4, 1893,	Statu. burglary,	2 years,	Dec. 29, 1894.	5 days.	
Martin, Thomas,	32	35	Polisher,	Ireland,	Hartford,	Sept. 13, 1892,	Statu. burglary,	2½ years,	Nov. 7, 1894.	...	2d commitment.
Marshall, John,	57	59	Farmer,	New York,	Bridgeport,	Feb. 23, 1893,	Horse theft,	2 years,	Nov. 14, 1894.	....	

ROSTER OF CONVICTS DISCHARGED FROM CONN. STATE PRISON FROM OCT. 1, 1894, TO SEPT. 30, 1895.—*Continued.*

NAME.	Age when committed.	Present age.	Occupation.	Nativity.	Where convicted.	When committed.	Crimes.	Sentence.	When discharged.	Good time lost.	Remarks.
Mahoney, James,	19	21	Laborer,	Connecticut,	Bridgeport,	Sept. 13, 1893,	Burglary,	1½ years,	Dec. 27, 1894.	....	
Mavoe, Fernald,	32	34	Fireman,	France,	Litchfield,	Oct. 19, 1893,	Adultery,	2 years,	July 10, 1895.	....	
Malidonian, Hampertz'n,	18	19	Carpenter,	Armenia,	New London,	Jan. 5, 1894,	Burglary,	1 year,	Jan. 4, 1895.	50 days.	
Mason, Isaac,	17	18	Millhand,	Ireland,	Danbury,	May 9, 1894,	Burglary,	1 year,	Mar. 19, 1895.	....	
Meloney, Marvin W.,	28	31	Farmer,	Connecticut,	Hartford,	Dec. 6, 1892,	Wilfully injuri'g R.R. property,	3 years,	July 8, 1895.	....	$10-fine paid.
Miller, Chas. H.,	45	48	Painter,	Connecticut,	New Haven,	April 26, 1892,	Statu. burglary,	3 years,	Nov. 26, 1894.	....	
Morris, Carlo,	24	27	Laborer,	Italy,	Hartford,	June 7, 1892,	Statu. burglary,	3 years,	Jan. 12, 1895	5 days.	
Moran, Stephen,	31	33	Painter,	Connecticut,	New Haven,	April 4, 1893,	Theft,	2 years,	Dec. 24, 1894.	...	3d offense.
Moulton, A. J.,	33	35	Farmer,	Massachusetts	Winchester,	June 21, 1893,	Burglary,	2 years,	Mar. 12, 1895.	...	
Moran, Thomas,	21	22	Laborer,	Connecticut,	Bridgeport,	Feb. 21, 1894,	Burglary,	1 year,	Jan. 1, 1895.	....	
Murphy, John,	23	26	Sailor,	Connecticut,	New London,	Sept. 20, 1892,	Burglary,	3 years,	April 22, 1895.	....	
Murphy, Lawrence,	23	25	Hostler,	Virginia,	New Haven,	Jan. 12, 1893,	Statu. burglary,	2 years,	Oct. 3, 1894.	...	
Murphy, Thomas,	23	25	Bottler,	Connecticut,	Danbury,	Oct. 19, 1893,	Theft from person,	2 years,	July 10, 1895.	....	
McCullough, Thomas,	27	28	Lineman,	Ireland,	Bridgeport,	Feb. 21, 1894,	Theft from person,	1 year,	Jan. 1, 1895.	...	
Niles, John,	35	36	Mason,	Ireland,	Putnam,	Sept. 4, 1894,	Adultery,	1 year,	July 15, 1895.	....	2d com'tment; sent to Insane Hosp. Nov. 17, '93, re-t'ned Apr.23,'94.
O'Neil, John,	30	32	....	Connecticut,	Bridgeport,	Feb. 22, 1893,	Burglary,	2 years,	Nov. 13, 1894	. .	
Page, Stephen E.,	38	43	Blacksmith,	Rhode Island,	Putnam,	Sept. 11, 1890,	Horse stealing,	5 years,	Dec. 29, 1894.	....	
Palmer, Julius,	33	35	Laborer,	Connecticut,	New Haven,	April 11, 1893,	Arson,	2 years,	Dec. 31, 1894.	...	
Peck, Geo. W.,	34	38	Farmer,	Connecticut,	New Haven,	April 29, 1892,	Statu. burglary,	3½ years,	May 1, 1895.	....	

Plumb, John H.,	28	30	Bicycle Inspector,	Connecticut,	Hartford,	Dec. 12 1893,	Pas. count'f't mon,	1 year,	May 10, 1895.	....	2d com'tm't; $100-fine, worked out.
Porter, Charles,	26	30	Plumber,	Connecticut,	New Haven,	April 7, 1892,	Horse stealing,	4 years,	Sept. 14, 1895.	....	Negro, *alias* Henry Rogers.
Potter, George,	57	60	Farmer,	Connecticut,	Litchfield,	Oct. 14, 1892,	Adultery,	3 years,	May 16, 1895.	....	
Pond, John D.,	24	26	Steamfitter,	Scotland,	Hartford,	Sept. 12, 1894,	Theft,	14 months,	Sept. 12, 1895.	....	
Price, William B.,	38	39	Engineer,	Connecticut,	Norwich,	Jan. 16, 1895,	Statu. burglary,	15 months,	June 6, 1895.	...	Pard. by Board Pard.
Rabbitt, Jas. H.,	30	33	Carpenter,	Ireland,	Bridgeport,	Sept. 16, 1892,	Forgery,	3 years,	Dec. 4, 1894.	...	Pard. by Board Pard.
Rice, Ernest D.,	22	24	Watchmaker,	Connecticut,	Hartford,	Mar, 14, 1893,	Embezzlement,	2 years,,	Dec. 18, 1894.	15 days.	
Riley, James,	19	20	Laborer,	Connecticut,	Hartford,	June 5, 1894,	Statu. burglary,	1 year,	April 15, 1895.	....	
Rockwell, Robert,	27	29	Machinist,	Rhode Island,	Bridgeport,	May 23, 1893,	Horse theft,	2 years,	Feb. 11, 1895.	....	
Roper, James,	24	26	Lather,	Ireland,	Hartford,	June 5, 1894,	Statu. burglary,	1½ years,	Sept. 25, 1895.	5 days.	
Ryan, William,	27	32	Jeweler,	Massachusetts	Middletown,	April 7, 1891,	Burglary,	5 years,	July 31, 1895.	5 days.	2d com't, *ali's* Wm. M. Mahon, 2 indictm's, 2½, 2½.
Ryan, William, No. 2,	28	30	Laborer,	Connecticut,	Bridgeport,	Feb. 22, 1894,	Theft from person,	20 months,	July 28, 1895.	...	2d commitment.
Ryan, William, No. 4,	40	41	Laborer,	Ireland,	Litchfield,	Nov. 8, 1894,	Burglary,	1 year,	Sept. 18, 1895	....	
Ryan, James, No. 2,	36	37	Electrician,	New York,	New Haven,	Jan. 2, 1895,	Being a tramp,	6 months,	July 1, 1895.	....	
Schmidt, Rudolph,	21	25	Baker,	Germany,	Hartford,	Mar. 8, 1892,	Burglary,	4 years,	Aug. 22, 1895.	7 days.	
Schmidt, Hammer,	22	24	Laborer,	England,	Bridgeport,	Sept. 13, 1893,	Burning barn,	2 years,	June 14, 1895.	10 days.	
Smith, Howard,	24	26	Hostler,	Connecticut,	Hartford,	Mar. 7, 1893,	Statu. burglary,	2 years,	Nov. 26, 1894.	....	
Smith, John,	30	31	Stove moulder,	New York,	Danbury,	Oct. 18, 1894,	As'lt, intent to kill.	1 year,	Aug. 28, 1895.	....	
Smith, James,	39	39	Laborer,	Massachusetts	Norwich,	Jan. 3, 1895,	Being a tramp,	3 months,	April 2, 1895.	...	
Spooner, Bert,	19	23	Laborer,	New York,	Danbury,	May 11, 1892,	Robbery,	4 years,	Dec. 5, 1894.	....	Pard. by Board Pard.
Strong, William,	19	21	Farmer,	Connecticut,	Litchfield,	May 11, 1893,	Horse stealing,	2½ years,	July 8, 1895.	....	
Sullivan, Jeremiah,	50	60	Farmer,	Ireland,	Norwich,	Jan. 8, 1887,	As'lt, at'mpt mur,	10 years,	Aug. 26, 1895.	15 days.	
Sullivan, John,	23	24	Laborer,	Ireland,	New London,	Sept. 13, 1893,	Theft from person,	16 months,	Nov. 23, 1894.	15 days.	
Swartz, Felix,	26	28	Watchmaker,	Poland,	Bridgeport,	Sept. 14, 1893,	Theft from person,	22 months,	April 24, 1895.	....	

ROSTER OF CONVICTS DISCHARGED FROM CONN. STATE PRISON FROM OCT. 1, 1894 TO SEPT. 30, 1895.—*Continued.*

NAME.	Age when committed.	Present age.	Occupation.	Nativity.	Where convicted.	When committed.	Crimes.	Sentence.	When discharged.	Good time lost.	Remarks.
Tick, William,	34	36	Fireman,	Germany,	New Haven,	Jan. 4, 1894,	Theft,	2 years,	Sept. 25, 1895.	....	
Tolliver, James,	26	29	Barber,	Massachusetts	Hartford,	Dec. 6, 1892,	Statu. Burglary,	3 years,	July 18, 1895.	....	
Trowbridge, Fred R.,	21	22	Brakeman,	Connecticut,	Putnam,	Sept. 4, 1894,	Stealing bicycle,	1 year,	July 15, 1895.	....	
Tracy, Frank,	29	30	Shirt cutter,	Connecticut,	Waterbury,	June 19, 1894,	Burglary,	1 year,	April 29, 1895.	....	
Waterbury, Chas. E.,	26	30	Farmer,	Connecticut,	Bridgeport,	March 3, 1892,	Kidnapping,	4 years,	Aug. 10, 1895.	....	
Walton, Edward,	39	42	Farmer,	Virginia,	Danbury,	May 24, 1892,	Manslaughter,	3 years,	Dec. 24, 1894.	....	Negro; 2d commitment.
White, Chas. E.,	36	37	Laborer,	Connecticut,	New Haven,	July 5, 1894,	Adultery,	1 year,	May 15, 1895.	....	Negro.
Wilroy, Walter,	24	25	Laborer,	Connecticut,	New Haven,	Jan. 5, 1894,	Forgery,	1 year,	Nov. 15, 1894.	....	
Woods, Frank,	21	24	Painter,	Connecticut,	Hartford,	June 9, 1892,	Theft from person,	3 years,	Jan. 9, 1895.	....	
Woods, Henry,	27	28	Cook,	No. Carolina,	Bridgeport,	Sept. 15, 1893,	Ass'lt int. to kill,	20 months,	Feb. 18, 1895.	....	Negro.
Worden, Herbert,	23	24	Machinist,	Connecticut,	Norwich,	May 10, 1894,	Burglary,	1¼ years,	June 20, 1895.	10 days.	2d commitment.
Young, Fred'k,	17	26	Carpenter,	Connecticut,	Brooklyn,	April 15, 1886,	Murder, 2d degree,	Life,	Dec. 5, 1894.	....	Pard. by Board Pard.

ROSTER OF CONVICTS THAT HAVE DIED AT CONNECTICUT STATE PRISON FROM OCT. 1, 1894, TO SEPT. 30, 1895.

NAME.	Age when committed.	Age at death.	Occupation.	Nativity.	Where convicted.	When committed.	Crime.	Sentence.	Died.	Cause of Death.
Benham, W. G.,	54	56	Bookbinder,	Connecticut,	New Haven,	July 6, 1892,	Burglary,	3 years,	Dec. 30, 1894.	Cardiac dropsy.
Cronin, John,	38	38	Farmer,	Connecticut,	Hartford,	Mch. 20, 1894,	Murder, 1st deg.,	Death,	Dec. 18, 1894,	Execution by hanging as per order of court.
Ford, Patrick,	26	29	Laborer,	Connecticut,	New Haven,	Oct. 13, 1891,	Horse Stealing.	5 years,	Nov. 14, 1894,	Phthisis Pulmonalis.
Graham, Archibald,	66	74	Gardner,	Scotland,	Norwich,	Jan. 5, 1887,	Arson,	10 years,	Mar. 19, 1895,	La Grippe and debility.
Hennessey, Michael,	65	66	Farmer,	Ireland,	Litchfield,	May 10, 1894,	Manslaughter,	$1, 10 yrs.	Jan. 13, 1895,	Apoplexy.
Leoine, Frank,	22	24	Farmer,	France,	Putnam,	Sept. 5, 1893,	Theft,	4 years,	Feb. 12, 1895,	Phthisis pulmonalis.
Padden, John,	28	31	Teamster,	Connecticut.	New Haven,	Jan. 8, 1892,	Burglary,	5 years,	Feb. 13, 1895,	Phthisis pulmonalis.
Papa, Michael,	31	33	Laborer,	Italy,	New Haven,	Apr. 5, 1892,	Ass'ult int. to kill,	3 years,	Oct. 27, 1894,	Cerebral Apoplexy.
Reed, W. H. & *alias* Clark,	42	45	Hatter,	New York,	Bridgeport,	Mch. 1, 1892,	Rape,	15 years,	Aug. 17, 1895,	Chronic Diarrhoea.
Sheridan, Michael,	16	18	Laborer,	Connecticut,	Hartford,	Sept. 15, 1892,	Burglary,	5 years,	Dec. 26, 1894,	Phthisis pulmonalis.
Tartaglia, Antonio,	23	23	Laborer,	Italy,	Waterbury,	Feb. 20, 1894,	Burglary,	7 years,	Nov. 29, 1894,	Phthisis Pulmonalis.
Trowbridge, Elisha,	59	59	Porter,	Connecticut,	New Haven,	Jan. 8, 1895,	Assault int. mur.,	10 years,	Sept. 8, 1895,	Apoplexy.
Wood, George,	17	18	Mill hand,	France,	Putnam,	Sept. 6, 1893,	Ass'ult int. to kill,	4 years,	Nov. 4, 1894,	Septic fever.

ROSTER OF LIFE CONVICTS CONFINED IN CONNECTICUT STATE PRISON, SEPTEMBER 30, 1895.

NAME.	Age when committed.	Age at present.	Occupation.	Nativity.	Where convicted.	When committed.	Crime.	Sentence.	Remarks.
Allen, George,	33	51	Farmer,	Connecticut,	Bridgeport,	Sept. 7, 1877,	Murder, 2d degree,	Life,	
Alexander, Lorena,	44	61	....	New York,	Bridgeport,	Nov. 8, 1078,	Murder, 2d degree,	"	
Albrecht, Walter,	26	29	Butcher,	Germany,	Hartford,	Sept. 16, 1892,	Rape,	"	
Bassett, Frank,	24	39	. ...	Connecticut,	Bridgeport,	Mar. 1, 1879,	Murder, 2d degree,	"	Sent to Insane Hospital July 15, 1893 returned to prison April 23, 1894.
Belware, Hazen,	45	50	Laborer,	Canada,	Hartford,	Dec. 19, 1890,	" "	"	
Bishop, Wesley W.,	33	48	Druggist,	Connecticut,	Norwich,	May 20, 1879,	" "	"	
Bradley, Geo., No. 2,	24	30	Laborer,	Connecticut,	Hartford,	June 5, 1889,	" "	"	
Buckholtz, William,	25	40	Bookkeeper,	Germany,	Bridgeport,	June 1, 1880,	" "	"	
Caruso, Lorenzo,	27	27	Laborer,	Italy,	New Haven,	July 2, 1895,	" "	"	
Chamberlain, H. B.,	22	30	Clerk,	Connecticut,	New Haven,	July 18, 1887,	" "	"	
Cobb, Kate,	31	46	....	Connecticut,	Norwich,	Jan. 17, 1879,	" "	"	
Conant, Frank V.,	34	45	Salesman,	Mass.,	New London,	Oct. 15, 1884,	" "	"	
Coyle, Richard,	58	67	Cloth finisher,	Ireland,	Norwich,	May 4, 1886,	" "	"	
Davis, John H.,	27	43	Laborer,	Mass.,	Hartford,	April 3, 1879,	" "	"	
Daly, Mary,	45	48	....	Ireland,	Windham,	Jan. 20, 1892,	" "	"	
Donovan, Michael,	46	47	Laborer,	Ireland,	Norwich,	June 5, 1894,	" "	"	
Dynes, John,	19	41	Shoemaker,	Connecticut,	Hartford,	Sept. 23, 1873,	" "	"	Ret. from Insane Hosp. Nov. 28, 1892.
Ellis, Jefferson,	34	49	....	New York,	Haddam,	Dec. 12, 1879,	" "	"	Attempted suicide by hanging March 23, 1883; sent to Ins. Hos. Nov. 17, 1893, returned to pris. Apr. 23, '94.
Feeney, Martin,	37	45	Rubber cutter,	Vermont,	Waterbury,	Nov. 1, 1887,	" "	"	

Gilbert, Charles,	25	60	Painter,	Connecticut,	Hartford,	May 4, 1865,	Murder, 2d degree,	Life,	Sent Ins. Hosp. Sept. 10, 1874, ret. to prison, Oct. 17, 1874.
Gong, Charles,	19	23	Laundryman,	China,	Hartford,	Sept. 9, 1891,	" "	"	*Alias* Chas. Lee Coon & Lee Yeon Goon.
Graves, Oscar,	18	40	Carriage painter,	Connecticut,	Hartford,	Sept. 23, 1873,	" "	"	
Hawley, John,	30	57	Laborer,	Connecticut,	Danbury,	Oct. 21, 1868,	Rape,	"	Negro.
Hall, Frederick,	32	56	Laborer,	Mass.,	Litchfield,	July 19, 1871,	Murder, 1st degree,	"	Negro; sentenced to be hung, and commuted by General Assembly.
Hawley, James,	26	29	Laborer,	Connecticut,	Litchfield,	May 12, 1892,	Murder, 2d degree,	"	
Hawley, John, No. 2,	39	42	Janitor,	Connecticut,	Bridgeport,	Oct. 7, 1892,	" "	"	Negro.
Kennedy, John P.,	28	38	Cow herder,	Kansas,	New London,	April 2, 1885,	" "	"	
Lynch, Patrick,	38	56	Laborer,	Ireland,	New Haven,	Oct. 26, 1877,	" "	"	
Perkins, Joel,	54	78	Carpenter,	Connecticut,	Litchfield,	April 28, 1871,	" "	"	
Rathburn, Chas. J.,	36	39	Farmer,	Connecticut,	New London,	Sept. 16, 1892,	" "	"	
Squires, Andrew,	40	50	Farmer,	Connecticut,	Brooklyn,	April 23, 1885,	" "	"	
Steere, Dwight F.,	28	47	Butcher,	Mass.,	Norwich,	April 24, 1876,	" "	"	
Stoffle, Rudolph,	40	46	....	Germany,	Bridgeport,	Oct, 18, 1889,	" "	"	Sent to Insane Hospital Nov. 17, 1893, returned to prison, Sept. 19, 1894.
Taylor, Jas. F.,	20	28	Bartender,	New York,	New Haven,	July 18, 1887,	" "	"	
Warren, John,	21	57	Farmer,	Connecticut,	Tolland,	Dec. 14, 1859,	" "	"	
Willis, Zyp,	45	48	Laborer,	Virginia,	Bridgeport,	Feb. 24, 1892,	Rape,	"	Negro; 2d commitment.

ROSTER OF CONVICTS CONFINED IN CONN. HOSPITAL FOR THE INSANE, MIDDLETOWN, CONN., SEPT. 30, 1895.

NAME.	Age when committed.	Age at present.	Occupation.	Nativity.	Where convicted.	When committed.	Crime.	Sentence.	Asylum.	Remarks.
Allen, William,	36	51	....	Maine,	Hartford,	Apr. 17, 1880,	Murder, 2d deg.,	Life,	Dec. 8, 1886.	2d commitment.
Anderson, Alonzo W.,	20	31	....	Connecticut,	Hartford,	Dec. 2, 1884,	Murder, 2d deg.,	Life,	Apr. 9, 1885.	
Atwood, Morris,	53	54	Farmer,	Connecticut,	New Haven,	July 3, 1894,	Arson,	7 years,	Dec. 12, 1894.	
Brooks, John R.,	32	35	Manufacturer,	England,	Bridgeport,	Sept. 22, 1892,	Ass'lt int. murder,	10 years.	June 8, 1895.	Sent Ins. Hosp. Sept. 13, '94; ret'd to pr. Dec. 12, '94, sent again June 8, '95.
Cherest, Michael,	20	43	....	Mass.,	Hartford,	May 11, 1872,	Murder, 2d deg.,	Life,	July 15, 1893.	Sent June 23, '86; ret'd Nov. 28, '92; sent July 15, '93.
Castagnetto, John,	18	29	Laborer,	New York,	New Haven,	Jan. 16, 1884,	Murder, 2d deg.,	Life,	June 8, 1895.	Sent Ins. Hosp. Dec. 8, '86; ret'd to pr Sept. 7, '87,; sent June 2, '90; ret'd May 26, '91; sent Sept. 13, '94; ret'd Mar. 5, '95; sent June 8, '95.
Corsa, George H.,	25	27	Laborer,	Connecticut,	Bridgeport,	Sept. 29, 1893,	Burglary,	3 y, 7 mos,	Apr. 13, 1894.	
Cuff, James,	33	68	....	Ireland,	Brooklyn,	Nov. 22, 1860,	Murder, 2d deg.,	Life,	Mar. 23, 1882.	
Daley, James,	28	28	Brakeman,	Connecticut,	Hartford,	Mar. 5, 1895,	Statut'ry burglary,	1½ year2,	Aug. 12, 1895.	
Dillon, John,	21	24	Laborer,	Ireland,	Hartford,	Sept. 16, 1892,	Rape,	Life,	Dec, 12, 1894.	
Doolittle, Wallis S.,	39	48	....	Connecticut,	New Haven,	Oct. 19, 1886,	Murder, 2d deg.	Life,	Mar. 26, 1892.	Sent Ins. Hosp. June 12, '91; ret'd to pr Dec. 19, '91; sent Mar. 26, 92.
Enright, Patrick,	22	28	Blacksmith,	Connecticut,	Bridgeport,	Oct. 17, 1889,	Rape,	10 years,	June 8, 1895.	
Eogeny, Philip,	19	23	....	Canada,	Litchfield,	Apr. 22, 1891,	Assault int. rape,	5 years,	July 15, 1893.	
Favetti, Philip,	38	45	....	Italy,	Norwich,	May 11, 1888,	Murder, 2d deg.,	Life,	July 15, 1893.	Sent Ins, Hosp. Feb. 13, '90; ret'd to pr. July 10, '90; sent July 15, '93.
Hauser, Frank,	22	23	Clerk,	Connecticut,	New Haven,	July 6, 1894,	Horse stealing,	2 years,	Sept. 13, 1895.	
Hotchkiss, Henry S.,	40	48	Drummer,	Connecticut,	Hartford,	Mar. 3, 1887,	Murder, 2d deg.,	Life,	Aug 12, 1895.	
Johnson, Fred H.,	43	44	Buffer,	Connecticut,	Bridgeport,	Feb. 17, 1892,	Horse theft, burg.,	10 years,	July 15, 1893.	
Jackson, Henry,	34	35	Cook,	Connecticut,	New Haven,	Sept. 20, 1894,	Statut'ry burglary,	5 years,	Dec, 12, 1894.	
Kelly, William, No. 1,	25	27	Sailor,	England,	Haddam,	Sept. 26, 1893,	Statut'ry burglary,	1½ years,	Apr. 13, 1894.	

Kelly, Joseph,	55	55	Laborer,	Ireland,	Tolland,	Apr. 9, 1895,	Being a tramp,	9 months,	Aug. 12, 1895.	
Marshall, David,	18	19	Farmer,	Connecticut,	Litchfield,	Oct. 9, 1894,	Burg. in day time,	2 years,	Sept. 13, 1895.	
Murphy, John,	26	36	....	England,	Litchfield.	Apr. 15, 1885,	At'mpt to murder,	15 years,	Nov. 2, 1891.	
McIntyre, John,	41	44	Stone mason,	New York,	Litchfield,	May 9, 1892,	At'pt to com. rape,	6 years,	June 8, 1895.	Sent Ins. Hos. Sept. 13, '94; ret'd to pr. Mar. 5, '95.
McNamara, Michael,	45	60	....	Ireland,	Bridgeport,	Sept. 23, 1878,	Murder, 2d deg.,	Life,	Mar. 23, 1882.	
O'Donnell, Thomas,	16	19	Porter,	Connecticut,	Hartford,	Sept. 15, 1892,	Burglary,	5 years,	Apr. 13, 1894.	
Parretto, Salvatore,	34	35	Laborer,	France,	New Haven,	Jan. 4, 1894,	Theft	2 years,	June 8, 1895.	Sent Ins. Hosp. Sept. 13, '94; ret'd to pr. Mar, 5, '95; sent June 8, '95.
Perry, Fred'k A. S.,	42	49	....	Georgia,	Norwich,	Jan. 21, 1888,	Murder, 2d deg.,	Life,	Apr. 21, 1888.	
Phyfe, Edward,	21	22	Hostler,	Ireland,	Bridgeport,	Sept. 12, 1894,	Arson,	2 years,	June 8, 1895.	
Ritzer, Franciscio,	24	25	Baker,	Italy,	Danbury,	May 10, 1894,	Pass. c't'rfeit coin,	3 years,	Dec. 12, 1894.	
Romeni, Joseph,	33	38	Hod carrier,	Italy,	Bridgeport,	Mar. 5, 1890.	Ass'lt int. murder,	10 years,	Aug. 12, 1895.	Sent Ins. Hosp. Mar. 26, '92; ret'd to pr. Nov. 28, '92; sent July 15, '93; ret'd Nov. 17, '93; sent Apr. 13, '94; ret'd June 8, '95; sent Aug. 12, '95.
Rose, Manuel,	32	35	Laborer,	C. V. Islands,	New London,	Sept. 23, 1892,	Ass'lt int to kill,	5 years,	May 17, 1894.	
Sheedy, James,	24	24	Laborer,	Connecticut,	Hartford,	Mar. 5, 1895,	Theft from person,	20 months,	Aug. 12, 1895.	
Sperry, Edgar M.,	43	49	....	Connecticut,	New Haven,	July 11, 1889,	Ass'lt, fem. child,	12 years,	July 15, 1893.	
Vercessi, Pietro,	21	23	Candy maker,	Italy,	New Haven,	Sept. 19, 1893,	Pass. c't'feit coin.	$1 fin, 7y.,	Aug. 12, 1895.	U. S. Court.

CLASSIFICATION BY AGE OF CONVICTS IN CONFINEMENT, SEPTEMBER 30, 1895.

Age when Committed.	No.	Age, Sept. 30, 1895.	No.	Age when Committed.	No.	Age, Sept. 30, 1895.	No.
From 16 to 20,	42	From 16 to 20,	31	From 55 to 60,	6	From 55 to 60,	10
20 to 25,	110	20 to 25,	96	60 to 65,	5	60 to 65,	6
25 to 30,	79	25 to 30,	76	65 to 70,	2	65 to 70,	4
30 to 35,	61	30 to 35,	63	70 to 75,	1	70 to 75,	1
35 to 40,	42	35 to 40,	42	75 to 80,	0	75 to 80,	1
40 to 45,	20	40 to 45,	28				
45 to 50,	15	45 to 50,	25				
50 to 55,	12	50 to 55,	12	Total, . .	395	Total, . .	395

CLASSIFICATION BY OCCUPATION.

Occupation.	No.	Occupation.	No.	Occupation.	No.
Actors, . . .	1	Florists, . .	1	Physicians, . .	2
Butchers, . .	4	Fruit Dealers, .	1	Quarrymen, . .	1
Blacksmiths, . .	7	Grainers, . .	1	Railroad Men, .	8
Barbers, . .	5	Grooms, . .	2	Reporters, . .	1
Bookkeepers, . .	3	Gardeners, . .	1	Rubber Cutters, .	3
Brass Polishers, .	5	Glaziers, . .	1	Sailors, . .	9
Brakemen, . .	4	Granite Cutters, .	2	Salesmen, . .	3
Box Builders, .	1	Housekeepers, .	7	Steel Polishers, .	2
Bartenders, . .	2	Hatters, . .	7	Silver Chasers, .	1
Buffers, . .	4	Handymen, . .	1	Speculators, . .	1
Bank Teller, . .	1	Hostlers, . .	12	Steam Fitters, .	4
Bakers, .	3	Harness Makers, .	1	Stone Masons, .	3
Boatmen, . .	2	Jack Spinners, .	1	Shoe Makers, .	6
Bridge Builders, .	1	Janitors, . .	1	Stone Sculptors, .	1
Carpenters, . .	14	Laborers, . .	76	Stenographers, .	1
Cooks, . .	9	Lasters, . .	3	Shoe Cutters, .	1
Clerks, . .	4	Lithographers, .	1	Sawyers, . .	1
Cloth Finishers, .	1	Laundrymen, .	3	Slaters, . .	1
Coopers, . .	1	Locksmiths, . .	1	Stove Polishers, .	1
Carriage Painters, .	1	Mill Hands, .	3	Tool Makers, .	1
Carpet Layers, .	1	Machinists, . .	5	Timber Cutters, .	1
Cigarmakers, .	2	Milk Peddlers, .	4	Teamsters, . .	8
Coachbuilders, .	2	Marine Firemen, .	2	Tailors, . .	1
Cowherders, . .	1	Matchmakers, .	1	Tin Smiths, . .	1
Clothcutters, . .	1	Millers, . .	1	Vet. Surgeons, .	1
Druggist, . .	1	Moulders, . .	3	Upholsterers, .	1
Diesinkers, . .	1	Needlemakers, .	1	Waiters, . .	9
Drivers, . .	3	Organmakers, .	1	Wheelwrights, .	1
Dyers, . .	1	Painters, . .	15	Wool Carders, .	1
Errand Boys, .	1	Porters, . .	2	Weavers, . .	3
Electricians, . .	1	Pressmen, . .	1	Woodmarkers, .	1
Expressmen, . .	1	Printers, . .	2	Writing Masters, .	1
Engineers, . .	3	Plasterers, . .	4		
Farmers, . .	48	Proofreaders, .	1		
Firemen, . .	5	Plumbers, . .	1	Total, . .	395

CLASSIFICATION BY NATIVITY.

Nativity.	No.	Nativity.	No.	Nativity.	No.
Colorado,	2	Ohio,	4	Ireland,	29
Connecticut,	159	Pennsylvania,	7	Italy,	13
District of Columbia	4	Rhode Island,	6	New Brunswick,	1
Illinois,	5	Vermont,	2	Nova Scotia,	1
Indiana,	1	Virginia,	7	Poland,	1
Kansas,	2	Africa,	3	Portugal,	2
Kentucky,	1	Australia,	1	Prince Edwards Is.	1
Maine,	3	Canada,	10	Romania,	1
Maryland,	1	China,	2	Russia,	6
Massachusetts,	29	Cuba,	1	Sweden,	4
Michigan,	1	Denmark,	3	Switzerland,	1
New Hampshire,	1	England,	8	Wales,	2
New Jersey,	4	Finland,	1	West Indies,	1
New York,	52	France,	1		
North Carolina,	1	Germany,	10	Total,	395

Americans, 292. Foreigners, 103.

CLASSIFICATION BY CRIME.

Crime.	No.	Crime.	No.
Abusing a female child under 14 years,	2	Breaking and entering,	2
Arson,	5	Bigamy,	1
Assault with intent to murder,	7	Counterfeiting,	3
Assault and attempt to commit rape,	9	Carnally knowing and abusing female child,	4
Assault with intent to steal from the person,	1	Embezzlement,	1
Assault with intent to kill,	15	Escaping from jail,	3
Assault with intent to kill and burglary,	3	Forgery,	8
Assault with intent to commit sodomy,	1	Horse stealing,	31
Assault with intent to rob,	1	Highway robbery,	2
Assault with intent to kill and murder,	1	Intent to commit rape,	1
Assault with intent to rape female child,	1	Manslaughter,	13
Assault with intent to kill child,	1	Murder in 2d degree,	32
Assault with intent to commit rape, robbery and burglary,	1	Passing counterfeit money,	4
Assault,	1	Placing obstruction on railroad track,	1
Assault (Indecent),	1	Perjury,	1
Attempt to commit rape,	8	Rape,	15
Attempt and breaking jail to commit rape,	1	Robbery,	14
Attempt at burglary,	1	Robbery with violence,	1
Being a tramp,	3	Robbery and theft,	2
Being in a dwelling house unlawfully at night,	1	Statutory burglary,	44
Burglary,	83	Statutory burglary and theft,	1
Burglary in daytime,	2	Statutory burglary and arson,	2
Burglary and horse stealing,	2	Statutory burning of a private building,	1
Burglary with personal violence,	1	Stealing bicycle,	2
Burning barn,	4	Theft,	23
		Theft from person,	23
		Theft and burglary,	2
		Unlawful co-habitation,	1
		Willful burning of property,	1
		Total,	395

CLASSIFICATION BY SENTENCE.

Sentence.	Fine.	No.	Sentence.	Fine.	No.
8 months,	....	1	6 years, 6 months,	....	1
9 months,	....	1	7 years,	....	16
10 months,	....	1	7 years and fine,	$1	1
1 year,	....	20	7 years, 6 months,	....	3
1 year, 2 months,	....	1	8 years,	....	8
1 year, 3 months,	....	3	8 years, 6 mos. and fine,	500	1
1 year, 4 months,	....	2	9 years,	....	3
1 year, 6 months,	....	24	9 years, 6 mos. and fine,	1	1
1 year, 8 months,	....	2	10 years,	....	12
1 year, 9 months,	....	1	10 years and fine,	100	1
2 years,	....	59	12 years,	....	9
2 years and fine,	$1	1	13 years,	....	1
2 years, 3 months,	....	1	14 years,	....	3
2 years, 5 months,	....	1	15 years,	....	9
2 years, 6 months,	....	11	16 years,	....	1
3 years,	....	50	18 years,	....	3
3 years, 6 months,	....	12	20 years,	....	4
4 years,	....	39	25 years,	....	1
4 years, 6 months,	....	2	35 years,	....	2
4 years, 8 months,	....	2	Life,	....	36
5 years,	....	33			
5 years, 6 months,	....	2			
6 years,	....	10	Total,		395

NUMBER OF PRISONERS IN CONFINEMENT SEPTEMBER 30, 1894.

Since Received, Deaths, Discharges, etc.

Whole number in confinement, September 30, 1894,	381	
Since received by commitment,	176	
Since received from Insane Asylum,	10—	567
Discharged by expiration of sentence,	133	
Discharged by pardon,	6	
Transferred to Insane Asylum,	20	
Died,	13—	172
Leaving in confinement, Sept. 30, 1895,		395

Commitments.

First commitment,	359	
Second "	25	
Third "	6	
Fourth "	2	
Fifth "	2	
Eighth "	1—	395

Color and Sex.

White males,	363	
White females,	5	
Colored males,	26	
Colored females,	1—	395

COMMITMENT BY COUNTIES.

From New Haven County,	101	
" Fairfield, "	95	
" Hartford, "	92	
" New London, "	43	
" Middlesex, "	19	
" Litchfield, "	18	
" Windham, "	16	
" Tolland, "	11—	395

Of the above 9 were sentenced by U. S. Court.

Highest number of convicts in confinement during the twelve months from October 1, 1894, to September 30, 1895,	420
Lowest number,	369
Average number,	403.36

THE SENTENCES OF PRISONERS IN CONFINEMENT ON SEPTEMBER 30, 1895, EXPIRES AS FOLLOWS:

In 1895,	39	1906,	1
1896,	131	1907,	3
1897,	66	1908,	2
1898,	33	1909,	1
1899,	27	1910,	1
1900,	15	1911,	1
1901,	15	1912,	1
1902,	8	1914,	2
1903,	8	Life,	34
1904,	5		
1905,	2		395

ROSTER OF PRISONERS SENT TO INSANE ASYLUM FROM OCTOBER 1, 1894, TO SEPTEMBER 30, 1895.

Ritzer, Francescio,	Dec. 12, 1894
Jackson, Henry,	" " "
Dillon, John,	" " "
Attwood, Morris,	" " "
Castignetto, John,	June 8, 1895
Brooks, John R.,	" " "
Enwright, Patrick,	" " "
Welch, Thomas,	" " "
McEntyre, John,	" " "
Burke, Edward,	" " "
Parretto Salvatore,	" " "
Phyle, Edward,	" " "
Hotchkiss, Henry,	Aug. 12, 1895
Kelly, Joseph,	" " "
Romeni, Joseph,	" " "

Sheedy, James,	"	"	"
Vercisse, Pietone,	"	"	"
Daley, James,	"	"	"
Hauser, Frank,	Sept.	13,	1895
Marshall, Daniel,	"	"	"

ROSTER OF PRISONERS RECEIVED FROM INSANE HOSPITAL FROM OCTOBER 1, 1894, to SEPTEMBER 30, 1895.

Brooks, John R.,	Dec.	12,	1894
Burns, John,	Mar.	5,	1895
Parretto, Salvatore,	"	"	"
McIntyre, John,	"	"	"
Castagnetto, John,	"	"	"
Shelton, Mark R.,	"	"	"
Burke, Edward,	"	"	"
Quigley, Thos.,	June	8,	1895
Romeni, Joseph,	"	"	"
Clark, Chas.,	"	"	"

ASSIGNMENT OF CONVICTS, SEPTEMBER 30, 1895.

Under contract,	295	Tailors,	2
Runners,	6	Barbers,	2
Tier men,	10	Sick in hospital,	12
Prison kitchen,	18	Nurses,	2
Warden's kitchen,	6	Laundry,	5
Engineer and firemen,	2	Females,	6
Back yard men,	5	Unemployed,	15
Outside gang,	17		
Bookbinder and shoemaker,	2	Total,	395

CONTRACTS.

Name of Contractor.	Class of Manufactures.	Date of Contract.	Time.	No. of Men.	Rate per Day.	Expiration of Contract.
Marcy Brothers & Co.,...	Boots and Shoes,	Feb. 1, 1892,	5 years,	48	$.50	Feb. 1, 1897
Marcy Brothers & Co.,...	Boots and Shoes,	Feb. 1, 1893,	5 years,	46	.50	Feb. 1, 1898
Marcy Brothers & Co.,...	Boots and Shoes,	Aug. 1, 1893,	5 years,	49	.50	Aug. 1, 1898
Marcy Brothers & Co.,...	Boots and Shoes,	Jan. 1, 1894,	5 years,	44	.50	Jan. 1, 1899
Holbrook, Glazier & Co.,.	Boots and Shoes,	Oct. 1, 1893,	5 years,	49	.50	Oct. 1, 1898
Total No. of men,..				236		

PIECE PRICE CONTRACT.

The New York Shirt Co.,	Shirts,	July 16, 1895	5 years,	From 60 to 100 Men.	50 cts. per dozen.	July 16, 1900

BIOGRAPHICAL TABLES OF THE 395 CONVICTS CONFINED IN THE CONN. STATE PRISON, SEPT. 30, 1895.

NO. 1. NATIONALITY OF PARENTS.

Number of Prisoners and Percentage.	Americans.		Irish.		Italian.		German.		French.		Scotch.		English.		Swiss.		Polish.		African.		Finns.		Portugese.		Danes.		Norwegians.		Jews.		Welch.		Chinese.		Swedes.	
	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.
395	167	174	132	130	10	10	17	19	15	15	8	9	23	16	1	1	4	3	2	3	1	1	1	1	2	2	1	1	5	5	1	0	2	2	3	3
Per cent.	42.2	44.0	33.4	32.9	2.5	2.5	4.3	4.8	3.7	3.7	2.0	2.2	5.8	4.0	.25	.25	1.0	.75	.5	.75	.25	.25	.25	.25	.5	.5	.25	.25	1.2	1.2	.25	....	.5	.5	.75	.75

NO. 2. RELIGIOUS FAITH OF PARENTS,

Number of Prisoners and Percentage.	Baptist.		Catholic.		Episcopal.		Presbyterian.		Protestant.		Methodist.		Congregational.		Evangelist.		Lutheran.		Heathen.		Unitarian.		Jews.		Universalists.	
	Fathers	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.	Fathers.	Mothers.
395	21	30	184	181	22	20	11	10	29	24	55	61	35	36	1	1	12	12	16	12	2	1	5	5	2	2
Per cent.	5.3	7.5	46.5	45.8	5.5	5.0	2.7	2.5	7.3	6.0	13.9	15.4	8.8	9.1	.25	.25	3.0	3.0	4.0	3.0	.5	.25	1.2	1.2	.5	.5

NO. 3. THE PERSONAL HABITS OF PARENTS; WHETHER THEY WERE CONVICTED OF CRIME; THE PERSONAL HABITS, EDUCATION AND DOMESTIC RELATIONS OF PRISONERS.

Number of Prisoners and Percentages.	Personal habits of Parents.			Number of Parents who drank.		Number of Parents convicted of crime.		Character of Prisoners' Home.			Average duration of Prisoner's home life.	Personal habits of Prisoners.			Number of Prisoners who used:				Number of Prisoners who could read and write before conviction.		Number of Prisoners educated in:						Number who Graduated.	Number Married.	Number Single.
	Good.	Fair.	Bad.	Fathers.	Mothers.	Fathers.	Mothers.	Good.	Fair.	Bad.		Good.	Fair.	Bad.	Tobacco.	Alchol.	Opium.	Gambling.	Read.	Write.	Public School.	High School.	College.	Reform School.	C. S. Prison.	Private School.			
395	286	103	6	102	33	6	1	310	67	18	16.4	76	203	116	336	296	17	95	356	348	277	58	13	5	1	2	30	142	253
Per cent	72.4	26.0	1.5	25.8	8.3	1.5	.25	78.4	16.9	4.5	....	19.2	51.3	29.3	85.0	74.9	4.3	24.0	90.1	88.1	70.1	14.6	3.2	1.2	.25	.5	7.5	35.9	64.0

NO. 4. THE RELIGIOUS PREFERENCES OF PRISONERS; WHETHER THEY BELONG TO ANY FRATERNAL SOCIETIES, THE MILITARY OR NAVAL SERVICE, OR WHETHER THEY WERE IN JAIL, PRISON OR ARRESTED BEFORE.

Number of Prisoners and Percentages.	Baptists.	Catholics.	Congregational.	Episcopal,	Evangelists.	Heathens	Jewish.	Lutheran.	Methodists.	Presbyterians.	Protestants.	Universalists.	Number of Prisoners who belong to Fraternal Societies.	Number who were in the Military Service.	Number who were in the Naval Service.	Number in Jail before.	Number in Prison before.	Number arrested before.
395	18	159	36	23	1	28	5	13	64	8	30	2	51	67	22	150	72	210
Percent.	4.5	40.2	9.1	5.8	.25	7.0	1.2	3.2	16.2	2.0	9.6	.5	12.9	16.9	5.5	37.9	18.2	53.1

NO. 5. CAUSE OF CRIME.

Number of Prisoners and Percentages.	Drink.	Bad Company.	Destitution.	Suspicion.	Lust.	Ignorance of Money.	Desire of Gain.	Anger.	Opium.	Self Defense.	Innocent.	Conspiracy.	No cause Assigned.
395	209	53	20	3	18	1	10	5	2	1	36	7	30
Per cent.	52.9	13.4	5.0	.75	4.5	.25	2.5	1.1	.5	.25	9.1	1.7	7.5

PRISON RATIONS.

Sunday.	Breakfast,	Baked pork and beans, bread, and coffee.
	Dinner,	Beef or mutton soup and bread.
	Supper,	Bread and molasses.
Monday.	Breakfast,	Boiled rice, molasses, bread, and coffee.
	Dinner,	Corned beef, potatoes, and bread; corn, cabbage and turnips in their season.
	Supper,	Bread, butter, molasses, and tea.
Tuesday.	Breakfast,	Beef and potato hash, bread, and coffee.
	Dinner,	Stewed beans and bread.
	Supper,	Bread or bread pudding, molasses, and tea.
Wednesday.	Breakfast,	Fish and potato hash, bread, and coffee.
	Dinner,	Vegetable beef stew and bread.
	Supper,	Bread, butter, molasses, and tea.
Thursday.	Breakfast,	Beef and rice hash, bread and coffee.
	Dinner,	Corned beef, potatoes, and bread; corn, cabbage, and turnips, in their season.
	Supper,	Bread, molasses, and tea.
Friday.	Breakfast,	Rolled oats, molasses, bread, and coffee.
	Dinner,	Fish chowder, mashed potatoes, and bread, alternating with baked mackeral and salmon and alewives in season.
	Supper,	Bread, butter, molasses and tea.
Saturday.	Breakfast,	Beef hash, bread, and coffee.
	Dinner,	Stewed beans and bread.
	Supper,	Bread, molasses, and tea.
	NOTE:	Milk and sugar furnished for tea and coffee, and occasionally raw onions are issued.